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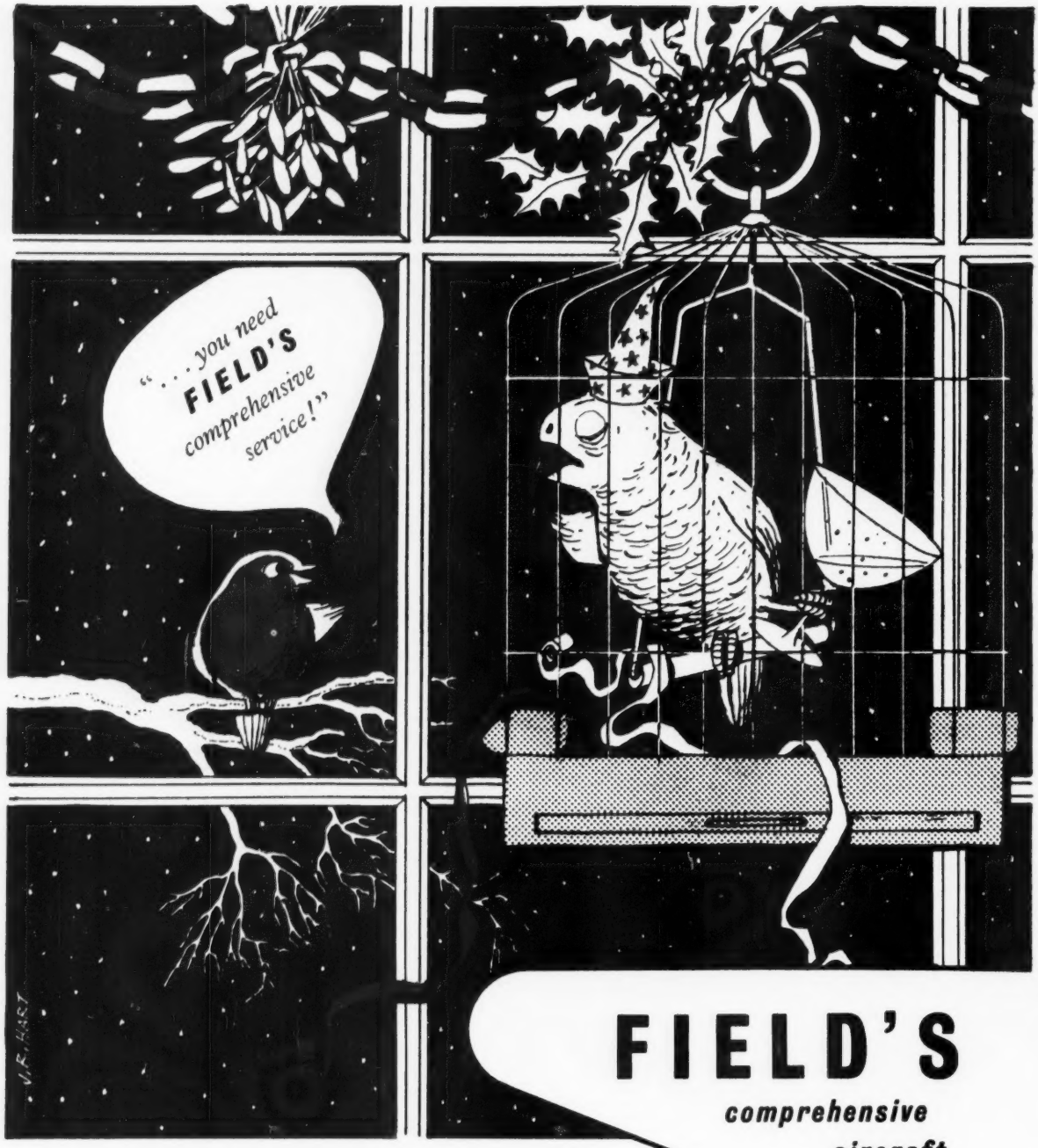

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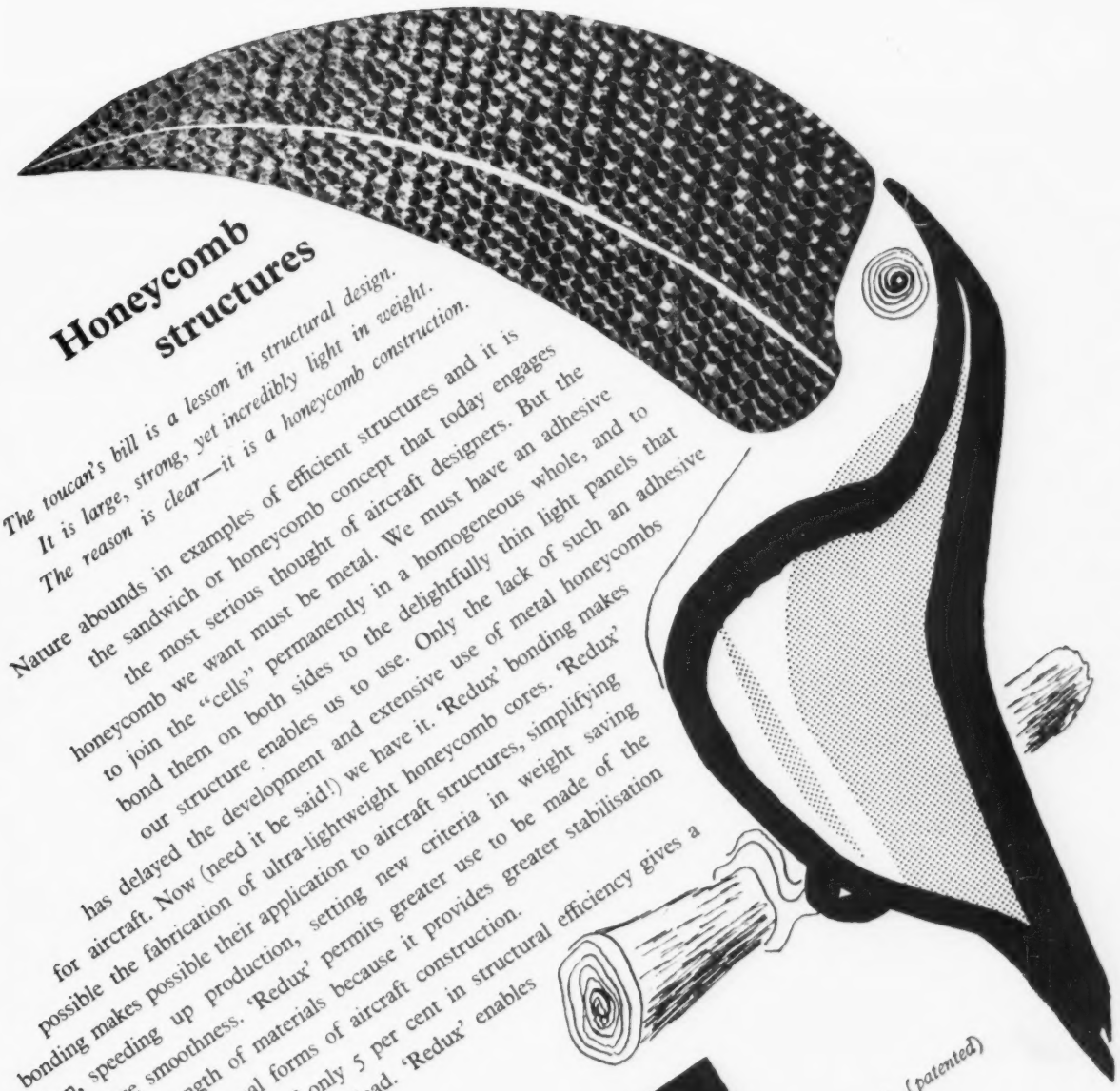

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United Airgram

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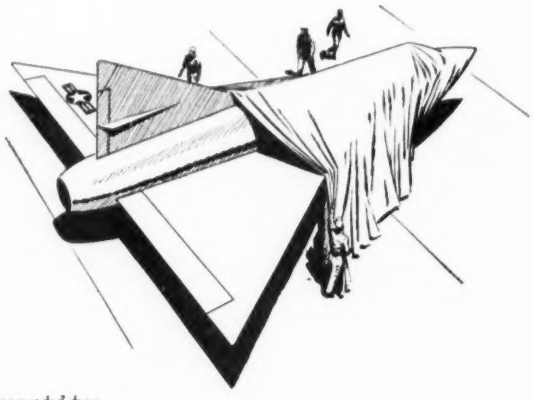
J-57 ENGINE SLATED TO POWER TWO MORE FIGHTERS

Two more advanced fighter planes, of which all details are still secret, have been added to the list of U.S. Air Force aircraft that will be powered by Pratt & Whitney Aircraft's big J-57 turbojet. These aircraft are the F-101, a long-range fighter built by the McDonnell Aircraft Corporation of St. Louis, Missouri, and the F-102, a supersonic, delta-winged interceptor built by Consolidated Vultee Aircraft Corporation. Both planes have been ordered into production.

The J-57 already powers North American's F-100 Super Sabre, the first model of which recently became the first combat airplane to exceed the speed of sound in level flight. The big, new turbojet also is installed in Boeing B-52 Stratofortress bombers, and has been selected as the power plant for several new U.S. Navy aircraft.



T-34 TURBOPROP PRODUCTION SCHEDULED

Pratt & Whitney's PT2F-1 turboprop engine, a commercial version of the military T-34, has been withdrawn from sale until a large enough market is developed to make its commercial manufacture economically feasible.

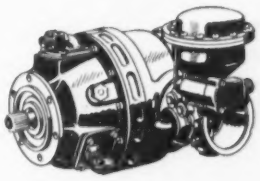
Meanwhile, in the military engine field, quantity production of the 5700-horsepower T-34 turboprop will be started soon. This engine will be installed in Lockheed, Douglas and Boeing military transports during 1954 and 1955, under Navy and Air Force contracts.

All three Pacific Coast manufacturers are modifying existing piston-engined aircraft designs for the big turboprop engine. Lockheed is building turboprop-powered Super Constellations for both the Navy and the Air Force. Douglas is building a turboprop model of the C-124 Globemaster transport for the Air Force, and Boeing is building T-34-powered Air Force C-97 transports.

HAMILTON STANDARD STARTERS EQUIP THREE NEW FIGHTERS

Hamilton Standard's small, light-weight jet engine starters are now being produced for three of the newest U.S. Air Force fighter planes, the North American F-86H Sabre, the North American F-100 Super Sabre, and the delta-winged Convair F-102.

The extreme light weight and small size of these pneumatic starters, which deliver high horsepower, contribute to overall performance of the new aircraft through lighter equipment weight and faster starting. Some models are about six times more powerful than the present electrical type of turbine engine starter. Pneumatic starters are also manufactured for three different jet bombers and two combustion-type starters are being developed.



PLANT EXPANSIONS PROGRESSING AT CHANCE VOUGHT

Expansion of facilities at Chance Vought Aircraft's big factory in Dallas, Texas, is well along toward completion. An addition to the main plant and a new structures laboratory building are almost ready for occupancy, while a large hangar building, for use in the Regulus missile program, will be finished soon.

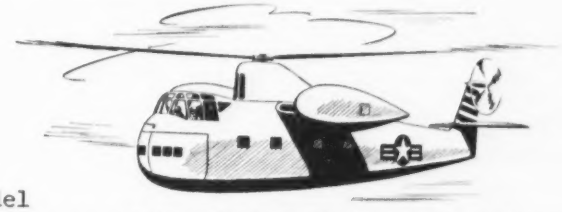
These structures are required in Chance Vought's expanded production program, which now involves the F7U-3 Cutlass jet fighter, the A2U-1 attack version of the Cutlass, and Regulus, the Navy's new surface-to-surface guided missile.

Rapidly expanding engineering work, meanwhile, has led to establishment of Chance Vought engineering offices in Boston, Massachusetts. As many as 200 engineers are anticipated for this facility, to augment the staff of 1500 men and women in Dallas.

TWIN-ENGINE SIKORSKY HELICOPTER ANNOUNCED

Production of a huge, twin-engine helicopter by Sikorsky Aircraft has been officially announced by the U.S. Marine Corps. It is designated the XHR2S. A high-ranking Marine Corps officer said the helicopter will carry two combat assault squads--about 26 combat-equipped men--and is the largest and fastest helicopter being built today.

The new aircraft is of conventional Sikorsky configuration, featuring a single, five-bladed main rotor, with an anti-torque tail rotor. Engines are located in outboard pods, into which the landing gear retracts. The machine also has large clamshell doors to facilitate loading.



Largest Sikorsky helicopter in present service with the Marines is the 10-place HRS. It is similar in size, shape and performance to the H-19 and H04S models, and to the S-55, the civilian commercial model flying passengers and freight in metropolitan areas of the United States and Europe.

Sikorsky is expected to be able to offer a commercial version of the big new helicopter in the not too distant future. It will be designated the S-56.

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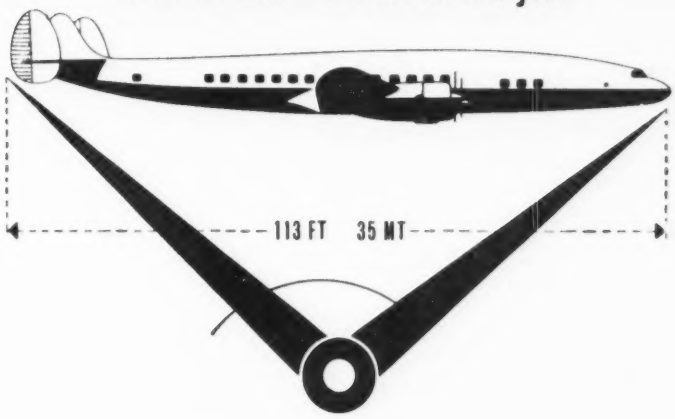

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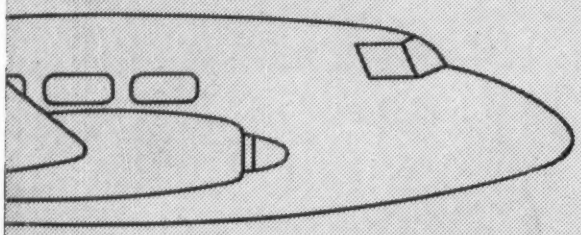

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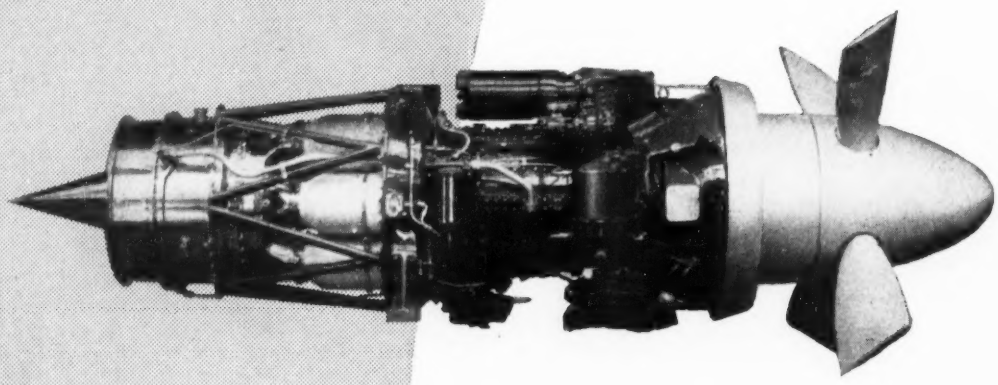

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First Aeronautical Weekly in the World

Founded 1909

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International Airworthiness

AMERICAN airworthiness certificates for Comets still seem to be far away and the subject continues to be surrounded with doubts and some mystery. One thing, however, is certain: that America, with or without jet transports of her own, should by now have been able to formulate national requirements in all the essentials if not in great detail. This is a necessary preliminary.

International agreements, particularly those of a technical nature, always take a long time to work out. This was a fact which the chairman of the Air Registration Board had in mind when preparing his 1951 annual report. He pointed out that the likelihood of design-novelties being included in each new type of aircraft meant that I.C.A.O. certification could be applied only to older classes of aeroplane. Then he stated: "I believe that if I.C.A.O. were to set itself the very modest target of establishing important fundamental requirements, filling in details only when stability has been achieved, more fruitful progress would be made." He added: "The Board is satisfied that British civil airworthiness requirements, which were the first to embody full international standards, provide an example which may be followed with confidence."

Obviously, if international standards can be agreed a great deal of time and trouble is going to be saved; but here we should discriminate between the significance of, on the one hand, acceptance of and compliance with I.C.A.O. standards so far as they go and, on the other, of reciprocal acceptance of national airworthiness certificates between two countries. The former is expected for operation by one country of a nationally certificated aircraft into or over other I.C.A.O. countries. The latter clears the way for the licensing and operation of a foreign aircraft in the country of the purchaser.

Already there is mutual acceptance of C.s of A. between Britain and America for piston-engined aircraft, and we believe that sooner or later, when America has experience of turbine transports, these, too, will be included. At the moment, however, it seems that other, non-technical, forces are preventing such agreement. We say "non-technical" because, so far as can be ascertained, discussions of technical matters between the A.R.B. and its American counterpart have always resulted in a reasonable measure of agreement and the resolution of problems. Sometimes the only difference of opinion is in the phraseology; the English and American languages are by no means identical. Even where a C. of A. for a piston-engined airliner is mutually acceptable the requisite documents differ considerably in the two countries.

So far as the C. of A. for the Comet 3 is concerned, and considering only the technical aspect, some Americans have suggested that they are being asked in effect for a *carte blanche* because no such flying machine exists as yet. We understand that fundamental technical requirements have, in fact, been largely settled and that even the outstanding details such as single *versus* double pressure-windows may well be agreed in good time. Following months of experience, incidentally, British opinion even more firmly favours the single-pane pressure window.

We note that Mr. Grover Loening, in an address at the recent convention banquet, at Wichita, of the National Aviation Trades Association, made some pertinent suggestions about airworthiness certificates. We are not yet in possession of the full text or background to his speech, and therefore make no comment other than that implied by quotation of extracts here. Mr. Loening called for a five-year moratorium on the C.A.A.'s requirement for airworthiness certificates. He thought that Government supervision of aircraft designs had hampered new development and that "these rules and regulations in general only represent the good practice of existing aircraft of the previous year. If there is a departure in design, new rules and regulations must be written before any [aircraft] can be made." The airworthiness certification law was based, he said, on two false assumptions. The first was that "the prospective buyer knows so little about aircraft that he needs the protection of a benevolent Government . . ."; the other was that "the constructor is so badly informed on air technique and aircraft engineering that he needs a handbook from the Government . . ."

It appears that these suggestions for a reform of C.A.A. methods are of a sweeping nature. For our part we have no doubts about the value of the work of our own A.R.B. or of the appreciation by the industry of the way in which it is carried out.

FROM ALL QUARTERS

The Royal Tour

LAST week, in a special article, we dealt in some detail with the arrangements made for the air sections of the world tour of the Queen and the Duke of Edinburgh. After crossing the Pacific in the liner *Gothic*, the Royal travellers were due to arrive at Suva, Fiji, yesterday, December 17th, and today and tomorrow they are making local flights in a Solent of Tasman Empire Airways, further details of which are now available. Today they are flying from Suva, across the island to Lautoka and back; tomorrow they make the three-hour flight to Tonga.

The flying-boat, R.M.A. *Aotearoa II*, is the aircraft which the Queen, as Princess Elizabeth, named at Belfast on May 26th, 1951. Its captain for the royal flights is Cpt. J. R. McGrane. A spare aircraft is being held in readiness at Suva and additional navigation aids have been specially installed at Tonga. Tomorrow, at Tonga, the royal party is to embark in *Gothic* for the last stage of the journey to New Zealand. In connection with this part of the tour, T.E.A. flew a party of journalists and cameramen and more than a ton of film and radio equipment from New Zealand to Suva.

Plans have also been announced, by Qantas Empire Airways, for four flights which the Queen and the Duke of Edinburgh will make in civil aircraft during their visit to Australia next February and March. The journeys will be from Melbourne to Brisbane (March 9th), Brisbane to Townsville (March 12th), Brisbane to Broken Hill (March 18th) and Adelaide to Kalgoorlie (March 26th). The aircraft used for all these flights will be a Constellation, modified to provide a separate cabin for Her Majesty; special catering facilities will also be installed.

The crew will consist of two captains and a first officer, radio officer, navigation officer, two flight engineers and cabin attendants. The senior captain for each flight will fly the route beforehand and make a special study of airport and other facilities.

A New C.A.S. for New Zealand

THE Royal New Zealand Air Force is to have a new Chief of the Air Staff, and the man selected is, like the present holder of the post, an R.A.F. officer. To take up his duties next February, the new C.A.S. is A.V-M. Walter Hugh Merton, C.B., O.B.E., at present Air Officer Commanding No. 22 Group, Technical Training Command. He succeeds A.V-M. D. V. Carnegie, C.B., C.B.E., A.F.C., who was appointed Chief of the Air Staff in January 1951.

Aged 48, A.V-M. Merton has had a distinguished career in the R.A.F. He was educated at Eastbourne and at Cranwell, where he was commissioned on the completion of his pilot training in 1925. After service in India from 1931 to 1936 and in the Middle East from 1940 to 1943, he was appointed assistant commandant of the R.A.F. War Staff College in 1943. In the following year he was appointed Director of Organization at the Air Ministry, a post which he held for two years. Appointments as a station commander in Bomber Command from 1947-1948 and as head of the R.A.F. Delegation and Air Officer Commanding, R.A.F., Greece, from 1949-50, followed before he assumed the post of A.O.C. No. 63 (Western and Welsh) Group, Home Command. Besides his awards of the C.B. and O.B.E., A.V-M. Merton has been mentioned three times in despatches and is also holder of Gold Cross of the Royal Order of George I with Swords (Greece).

FROM OTTAWA TO FILTON last week came Mr. T. N. Beaupré, Director of Aircraft Production, Canadian Department of Defence. He is seen here with (left and right) Mr. R. S. Brown and Mr. C. F. Uwins, respectively general manager and managing director of the Bristol Aeroplane Company's aircraft division, studying the British Messier landing-gear of a Britannia. It was recently announced that R.C.A.F. squadrons are to be equipped with a maritime-reconnaissance version of the Britannia.

The R.A.F. at Kitty Hawk

YESTERDAY—December 17th—was, as most readers will certainly be aware, the fiftieth anniversary of controlled, powered flight, and it was expected that the English Electric Canberra WE139, victor in the England-New Zealand Race, would fly the 3,688 miles from Wyton, Huntingdon, to Kitty Hawk, North Carolina, on the actual day, and not—as previously reported—on December 16th. It was to leave Wyton at 6 a.m. G.M.T., arrive at Gander, Newfoundland at 11.30 a.m., leave Gander at 2.10 p.m., and reach Kitty Hawk at 5.15 p.m. (12.15 p.m. local time); then it would fly over Kill Devil Hill, where the Wright brothers made their first flights, and land at nearby Elizabeth City. Afterwards the crew—F/L. R. L. E. Burton, A.F.C. (pilot) and F/L. D. H. Gannon, D.F.C. (navigator) were to lay on the Wright Memorial a wreath bearing the inscription *From the Air Council and Royal Air Force in tribute to Orville and Wilbur Wright*. In the evening the R.A.F. officers were to attend a commemorative dinner in Washington.

The Canberra is to return *via* Ottawa (visiting the R.C.A.F. Station at Uplands) on or about December 20th.

Mr. Claxton's Tour

LAST week Mr. Brooke Claxton, the Canadian Minister of Defence, made a tour of Canadian air force and army bases in Europe. Before going to the Continent it had been his intention to visit the R.C.A.F. at Langar, Notts, and North Luffenham, Rutland, but bad flying conditions made it impossible for his aircraft to get in at either base. He was, however, able to visit the Runnymede Memorial to lay a wreath.

Low cloud and fog also affected his flying programme on the Continent, but all five R.C.A.F. bases—Soest, Zweibrücken, Bad Söllingen, Metz and Gros Tenquin—were visited. His tour—a more detailed account of which will appear next week—ended with the NATO conference in Paris.

R.Ae.S. Belfast Lecture

THE second main lecture of the Royal Aeronautical Society to be held in Belfast took place on Thursday, December 10th. *Flight Simulators* was the subject, presented by Mr. G. C. Ring-

IN CONTROL: Air Chief Marshal Sir John W. Baker, Controller of Aircraft, M.o.S., recently visited the Avro works in Manchester. In the group discussing a project are, left to right, Mr. Stuart D. Davies (chief designer), Mr. J. A. R. Kay (director), Sir John Baker, and Sir Roy Dobson (managing director). With his back to the camera is Mr. A. J. K. Carline (in charge of projects).

COMING ALONGSIDE the photographic aircraft in nautical style is this Percival Sea Prince C.2 Admiral's Barge, recently delivered to the Flag Officer (Air) Home, Vice-Admiral Sir John Eccles, K.C.V.O., C.B., C.B.E., R.N. This is the second such aircraft to be delivered, amongst the numerous Sea Prince T.1 "flying classrooms" and C.1 and C.2 communications machines. All variants, of course, have Alvis Leonides engines.

ham and Dr. A. E. Cutler (respectively chief engineer and chief designer of the flight-simulator division of Redifon, Ltd.). At the lecture, which took place in the Whitla Hall of the Methodist College (and which we shall summarize in a forthcoming issue), Mr. Ringham described the value of flight simulators in increasing the efficiency of crew members, and discussed the economics of operating such equipment. Dr. Cutler then outlined the principles of simulator design, and described a typical installation; finally, a film showing sections of a simulated flight between Rome and London on the B.O.A.C. Comet installation was presented.

Following the lecture, a dinner was given by the chairman and directors of Short Brothers and Harland, in the Midland Hotel, Belfast. Present were members of the Belfast branch of the Society, headquarters representatives of the Society and other guests. The health of the Society and the guests was proposed by Rear Admiral M. S. Slattery, chairman of Shorts, and a reply was voiced by Dr. A. M. Ballantyne, secretary of the Royal Aeronautical Society.

Comet 2s: Preparations for Service

THAT Comet 2s (and the first Series 3) are progressing very satisfactorily was mentioned last week, following a visit we paid to the assembly line. To show the dozen or more recognizable Series 2s in a single photograph is impossible, but the view on this page, depicting part of the shops, is the first to be published of Series 2 assembly.

B.O.A.C. eagerly await their first Comet 2s, which are to be introduced on the South American service early next summer. It is learned that the makers' tropical trials will probably begin in Africa during the next two or three weeks. We hope, all the same, that John Cunningham will not have to forgo his Christmas holiday.

One of the important internal differences noted in the Comet 2, and one to which brief reference was made last week, concerns the front eight-seat compartment. This is backed by a structural bulkhead but the front bulkhead is non-structural, and small alterations have now made possible the fitting of forward-facing fully adjustable seats in the front row. On short flights the fixed-back seats of the Series 1 are adequate, but for several stages some people find that they become uncomfortable. Originally, we believe, this front cabin was visualized as a possible private compartment; but all seats, singly and at the normal fare, have been in demand on Comets in service. In all other respects Series 2 Comets will have interior arrangements very similar to the 1s.

The increased length of the Series 2 fuselage is not sufficient to make the type immediately distinguishable from the Series 1 except by an expert. We believe, however, that a longer fuselage enhances the appearance of the Comet, and that the Series 3 will prove to be the most handsome design so far.

No. 3 Squadron Standard Presented

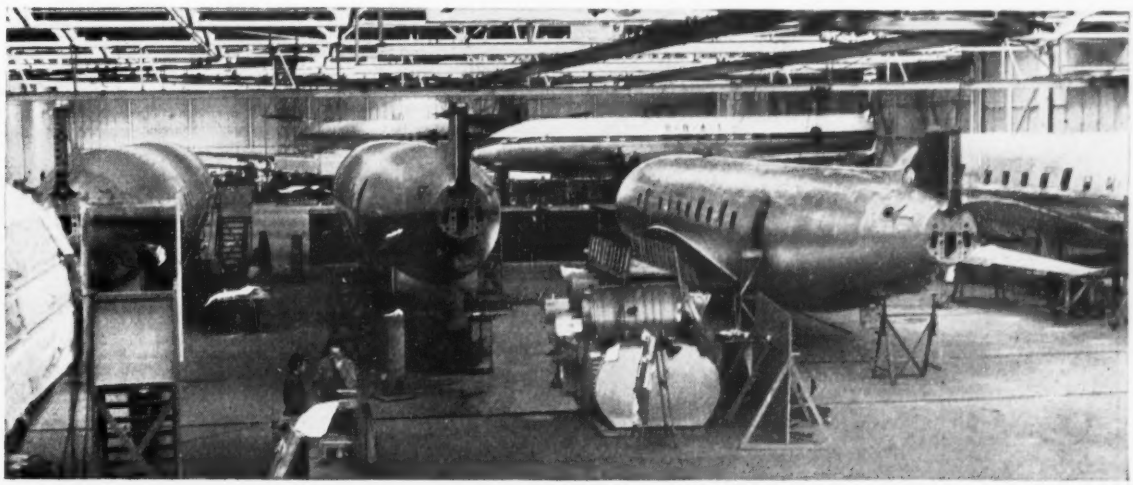
DESPITE appalling flying conditions at Geilenkirchen, Germany, Air Chief Marshal Sir Philip Joubert de la Ferté was able to land there in a D.H. Devon last Friday to present the Queen's Standard to No. 3 Squadron. Also attending the ceremony were Air Chief Marshal Sir Basil Embry and Air Marshal Sir Harry Broadhurst.

At this important presentation, to Britain's oldest "heavier-than-air" unit, *Flight* was exclusively represented; a description of the ceremony will be published in a forthcoming issue.

The Lockwood Marsh Sale

THE collection of aeronautical books and journals formed by Lt. Col. W. Lockwood Marsh, F.R.Ae.S., went under the hammer at the sale rooms of Hodgson and Co. in Chancery Lane on December 10th. A total of £3,337 was realized, a figure of £240 being recorded for a run of *Flight* for the years 1909-1948, in 56 volumes, quarto, cloth, without advertisements. The *Philosophical Collections* of R. Hooke, with folding plates, showing Besnier's flying machine and Lana's flying-boat (the rare seven numbers complete) fetched £132, and *A Few Remarks on Screw Propelled Aero-Plane Machines*, by F. J. Stringfellow, with six photographs, issued in Chard in 1892, realized £31. The highest price for a single lot—£280—was recorded for a run of the Aeronautical Society's *Journal* from the commencement in 1897 to 1943, together with the library catalogue.

SERIES 2 COMETS for B.O.A.C. take shape at Hatfield. Behind the photographer were a number of others. We published notes on the Series 2 last week, with particular reference to the new leading edge, and some additional information appears above (cockpit picture, p.822).



"Flight" photographs

Hangars 106 (left) and 107 comprise the Hurn assembly line. In various stages of completion are shown, from left to right, the 20th Viscount for B.E.A., the first, second and third for Aer Lingus and the seventh for Air France. Behind the first Irish Viscount is one of the last Hurn-built Varsities.

VISCOUNTS FROM HURN

New Production Line Under Way: Annual Output of 100 Envisaged

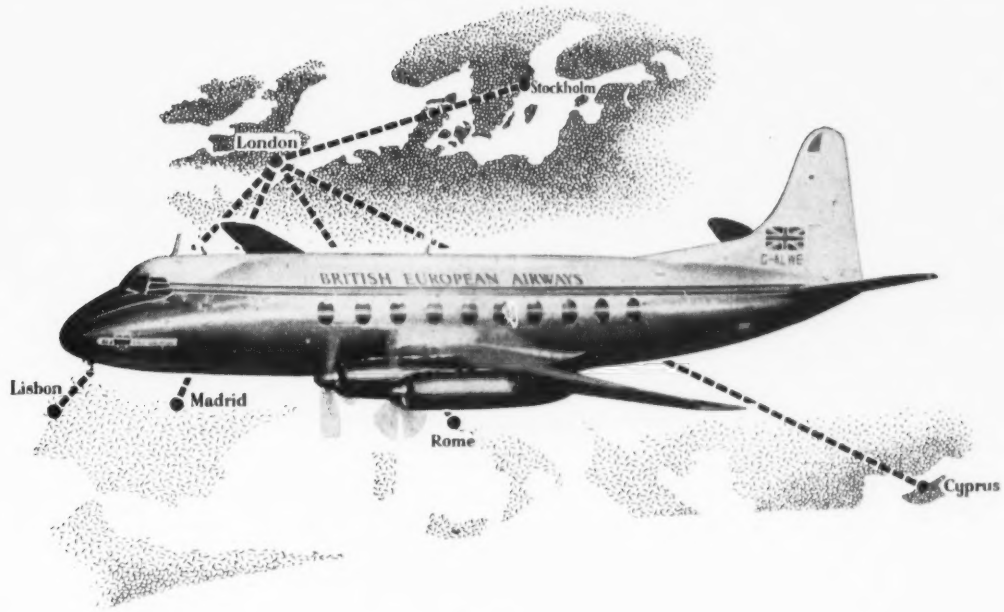
"UNDOUBTEDLY the Viscount has been the aircraft of the year in 1953." So writes the chief executive of B.E.A., Mr. Peter Masefield, in the December issue of the airline's house magazine; as evidence, he quotes some remarkable figures (reproduced on p. 803) illustrating the results of the first six months of scheduled operation with Viscounts. Progress with this successful turboprop airliner has not been confined to its introduction on the network of B.E.A. Vickers-Armstrongs have forged rapidly ahead with the parallel tasks of improving still further its economic performance and of ensuring prompt deliveries to all Viscount customers.

Just over a year ago, in announcing T.C.A.'s dollar order for fifteen Viscount 724s, *Flight* published the news that a second production line was being set up at Hurn near Bournemouth to build Viscounts at a planned rate of up to 100 per year. We added that in about eighteen months' time the Weybridge line would close down and that the first Hurn-built aircraft would appear at about the same time. Our estimate was, in the event, pessimistic. This new chapter in the encouraging story began on December 1st, when the Hurn factory completed its first aircraft—an achievement which does great credit to the enthusiastic Vickers-Armstrongs team headed by Mr. George Edwards, managing director of the aircraft division. Acceptance trials, consisting of some 15 hours' flying, were completed in about a week by test-pilots Jock Bryce and Guy Morgan, and B.E.A. were due to take delivery on Monday. By the time these words appear this aircraft, Viscount G-AMOO, should already have carried several hundred revenue passengers.

At a lunch celebrating the start of production at Hurn, Mr. Edwards reiterated his belief that no serious orders had been lost because of delivery dates. He made it plain that, so far as the Viscount was concerned, the Hurn factory would ensure that things stayed that way. Although there was so far no sign of an aircraft comparable to the Viscount, which first flew in 1948, and there was no engine anywhere quite like the Dart, there was no question of complacency. During the past six months he had had a sales team in every part of the world—"there is a death struggle going on this minute in India." Mr. Edwards suggested that one selling-point in favour of the British aircraft was the manufacturer's readiness to build an aeroplane tailored to each operator's requirements, which varied greatly. In this respect American firms inclined towards a "take it or leave it" attitude. At Weybridge there were about 100 draughtsmen working on interior layouts for the different series of Viscounts. This sort of design effort was one good reason why airliners would never be sold off the shelf. He did not think that the interval between order and delivery would ever be less than 18 months, but, at the same time, they would see that it was never longer than two years.

Recalling that a lot of Varsities had been made at the Hurn factory, helping to get it run-in as an aeroplane-making unit, Mr. Edwards paid tribute to Charles Tullett (works superintendent) and his staff for their fine work in taking over Viscount production from Weybridge. The new factory had "jiggery" capable of making eight Viscounts a month—"but the order books must be swelled before the string is pulled." Eighteen Viscounts had been delivered—fourteen to B.E.A. and four to Air France; two B.E.A. and two Air France machines were on acceptance trials. All but a few special Viscounts [the first of T.C.A.'s order, for example] would now be made at Hurn. They now held signed contracts for 86 Viscounts and another order for two awaited only

Hurn's first Viscount is G-AMOO "John Oxenham." It has the latest Rotol airscrews, with rounded tips, as fitted to the 13th and subsequent Viscounts.



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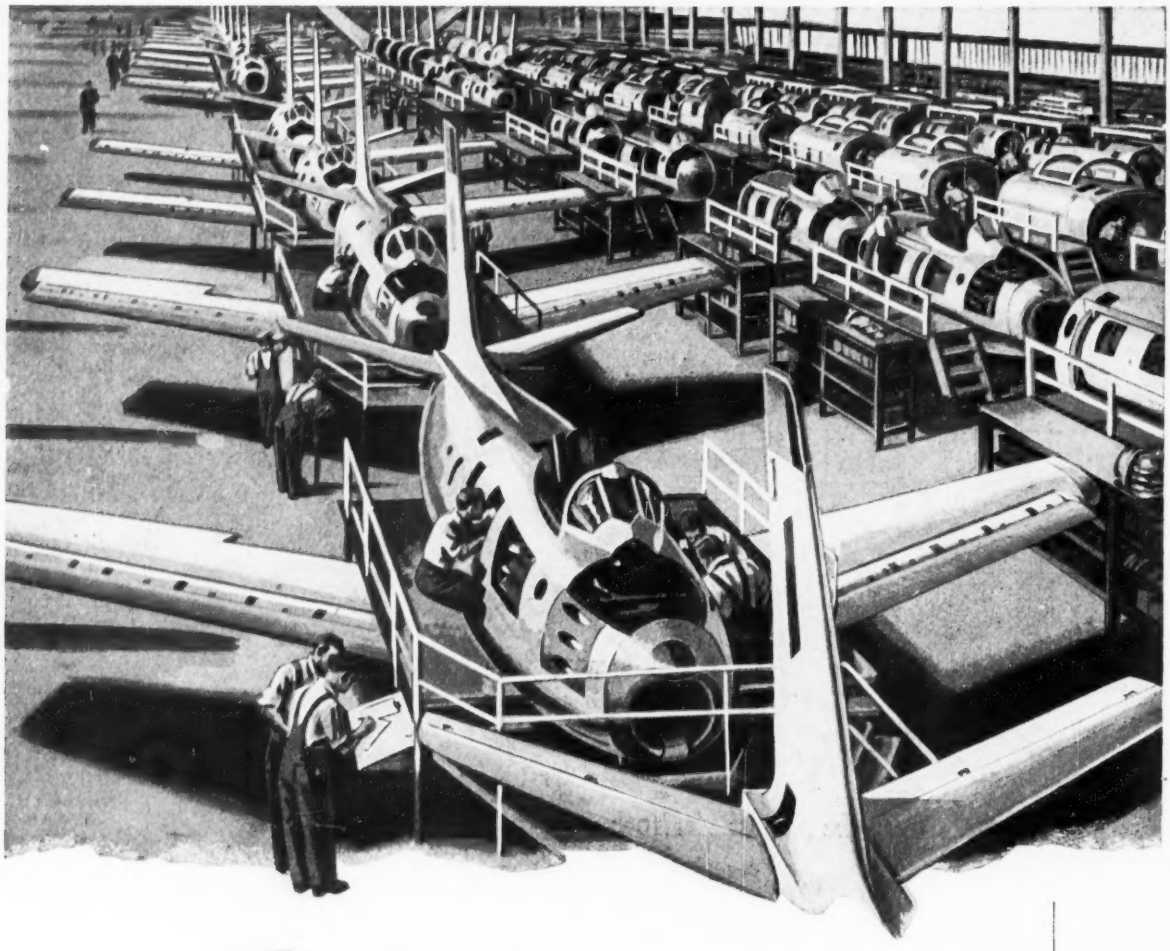


Production COUNTS— AT CANADAIR

Fifty Years of
POWERED FLIGHT...

But 16 years after the age of powered flight was ushered into the world, two intrepid Englishmen taxied down a rough air strip at St. Johns, Newfoundland.

16 hours and 12 minutes later these pioneers of the skies set their craft down at Clifden, Galway, Ireland. Capt. John Alcock and Lieut. Arthur Brown, the heroes of this 1,890-mile flight, were the first to fly non-stop between the new and the old world.

This first transatlantic flight opened up a new era. Today, the vast strides made in the field of aviation are dramatically expressed in the jet powered aircraft that now make the same flight safely in a fraction of the time.

At Canadair the first consideration is production: getting things done — that's Canadair.

At Canadair one quickly senses the steady tempo . . . the vigorous production flow . . . the sense of responsibility among the Canadair people and their pride of accomplishment in the finished product.

Yes, production counts at Canadair: counts in every aspect of manufacturing — in purchasing . . . engineering . . . tooling and planning — as Canadair builds lasting quality into the planes she makes.

For further information: European Representative, J. H. Davis, Princes House, 190 Piccadilly, London, W.1., England.

CANADAIR
LIMITED, MONTREAL, CANADA

"Flight" photograph

Series 701 Viscounts are now delivered to B.E.A. with both fore- and aft-facing seats, as in the Elizabethan. The interior shown is that of G-AMOO.

VISCOUNTS FROM HURN . . .

the signature; 50 more were in various stages of negotiation.

Vickers came to Hurn in May 1951, when the first prototype Valiant was sent there for flight trials; one hangar was acquired for this purpose. The total area occupied by the company has now reached over 320,000 sq ft and the factory consists of seven hangars with annexes, and 25 other buildings. Until recently the main activity was the assembly of Varsities at the rate of eight a month, together with the manufacture of major components for the Varsity, small parts for the Valiant, and flaps, dorsal fins and bulkheads for the Weybridge-built Viscounts. The factory now has 900 employees (planned strength is 1,500), and its facilities include a small machine-shop; a section in which the electrical assemblies are built up; a design drawing-office and stress office; a tool drawing-office; rate-fixing, planning, ordering and commercial departments; progress department and production control; and a works surgery. There is also a new building for pressure-testing of Viscount fuselages.

During a tour of the factory last week we saw machines for four different operators—B.E.A., Aer Lingus, Air France and T.A.A.—in varying stages of construction. The tour began at a fuselage jig containing a single frame for the third T.A.A. Viscount and concluded with the almost-completed G-AMOP, last of B.E.A.'s initial order for 20 Series 701s.

Fuselage assembly is undertaken in hangar No. 103, where both the tail sections and the main portions of the fuselage are fabricated. Noses and the tapering front and rear sections of fuselage are built up in another hangar (No. 267), which is also responsible for other cabin assemblies, including the cockpit coaming and nosewheel compartment. To provide for eventual production of "stretched" Series 800 Viscounts, the main fuselage-assembly jigs in hangar 103 can be adjusted by moving back the empennage pick-ups. The wings, which are made under sub-contract by Saunders-Roe, Ltd., are prepared for assembly in a third hangar, No. 101. Two other ancillary sections are hangars 104 (where completed aircraft are prepared for flight) and 105, which houses a fitting shop and spray shop.

Viscounts begin to take shape in hangar 107, which is the first part of the main assembly line. Fuselages are brought here after pressure-testing and as they move down the line on rails are fitted with inner wings and tails and provided with power units from the neat rows of Dart turboprops which flank the hangar walls. Undercarriages are then fitted, and the aircraft are wheeled into the seventh hangar (106) for further assembly work, emerging as brand-new Viscounts complete with glistening airline colour schemes.

Hurn's output will gradually be stepped up throughout next year, and by January 1955 Viscounts should be coming off the line at the rate of six per month. The Weybridge factory has now almost finished the initial batch of 24 aircraft, but will not cease completely to be concerned with the Viscount. Three of B.E.A.'s first 20 Series 701s (six more are on order) are still under construction at Weybridge.

As reported in *Flight* last week, the Corporation received £1.4m revenue from an average fleet of seven Viscounts during the first six months of scheduled services. Full results are as follows:—

Revenue hours flown, 6,140; revenue utilization hours per annum, 1,560; passenger miles flown, 45,000,000; passenger load-factor, 76 per cent; direct operating costs, £545,000; surplus on direct operating costs, £855,000; total costs (including all overheads and interest on capital), £1,005,000; surplus on total costs, £395,000; revenue load-factor to cover direct operating costs, 28.1 per cent; revenue load-factor to cover total costs, 51 per cent.

"C.G.G."

MANY in the aircraft industry must, like ourselves, have been saddened by the news of the passing of C. G. Grey on Wednesday, December 9th. On the day before he died he lunched, as on so many previous occasions, with colleagues and friends of the Circle of Aviation Writers. At the time of his death he was attending a reception at the Admiralty. He was 78 years old, and for the last year or two had been in indifferent health; yet, though he often joked about what he thought should be written in his own obituary, his many friends had come to regard him as well-nigh indestructible.

Charles Grey Grey will be remembered in particular as the founder of *The Aeroplane* and as its editor until 1939. He was born on November 13th, 1875, and was educated at the Erasmus Smith School, Dublin. He trained as an engineer at the Crystal Palace School of Engineering, and subsequently joined the staff of *The Autocar*.

Charles Grey Grey.

In his own *Story of "The Aeroplane,"* he describes how, as a member of the staff of *The Autocar*, at Christmas, 1908, he was sent by the editor to report the world's first aero show in Paris; and as a result of his report he was called upon by Iliffe and Sons, Ltd., to edit a penny weekly aviation paper called *The Aero*. In 1911, in partnership with Mr. E. V. (Later Sir Victor) Sassoon, he founded *The Aeroplane*, of which he retained the editorship until 1939. His editorship of *Jane's All the World's Aircraft* dated from 1916 and continued until 1941, and from 1939 he was air correspondent of the *Yorkshire Evening News, Lancashire Evening Post, Edinburgh Evening News*, and various overseas journals. His books included *A History of the British Air Ministry* (1940), *The Luftwaffe* (1944) and *The Civil Air War* (1945). He was a founder-member and Honorary Companion of the Royal Aeronautical Society.

Anyone who read C.G. in the twenties and thirties without having met him might have supposed that his critical references, and sometimes perverse and acid comments, reflected his nature and personality. Nothing could have been further from the truth. As long as we knew him he was a gentle and kindly man, always charming and generous to his friends, among whom he numbered rivals. Principal of these for many years was, of course, the late Stanley Spooner, founder-editor of our own journal. At a dinner in 1930 to mark 21 years of *Flight*, C.G. said he was reminded of the story of the little boy who, on being seen playing by himself, was asked if he had no little friends and who answered: "Yes, I have one, but I hate him." He had, he said, only one enemy—Stanley Spooner—and he loved him.

Today there are men on *Flight's* staff who recall a kind word of encouragement here or a spot of advice there from the one-and-only C.G., particularly when they were taking their first tentative steps in the hard and competitive world of journalism. His goodwill continued to be reflected in frequent correspondence.

From the first to the last occasion upon which we talked to him, he never once failed to express either an original thought or to reveal an unexpected viewpoint on some current topic. Neither his writing nor his conversation was ever lacking in humour. Regardless of one's age, Charles Grey was indeed an interesting companion as well as being the first great aviation journalist.

HERE AND THERE

NATO at Nicosia

A TWO-DAY NATO air conference ended in Nicosia on December 9th. The R.A.F. acted as host to senior staff officers of the American, Turkish, Greek and Italian Air Forces, and A.V-M. G. R. C. Spencer (S.A.S.O., M.E.A.F.) served as leader of the British team and as president. Mutual defence was discussed.

Quickly Home

ON December 7th one of the B-47s, of the U.S.A.F. 305th Bomb Wing returning after their 90 days' training period at Brize Norton, flew the 4,480 miles to MacDill Air Force Base in 8 hr 53 min (504 m.p.h.). This was 14 min less than a B-47's previous best time over the same route.

White House Pilot

THOUGH President Eisenhower makes considerable use of air transport, it is not generally known that he is himself a pilot. He learned to fly in an open-cockpit biplane in 1939, when he was a lieutenant-colonel on Gen. MacArthur's staff in the Philippines; later he was granted U.S. certificate No. 93258.

W.R.A.F Flying Commission

MISS JOAN LOCKWOOD, of Coventry, has been granted a flying commission in the W.R.A.F., with the rank of acting pilot officer. Miss Lockwood, who has been flying since she was 16, when she joined the Coventry Aero Club, is now 22 and is a schoolteacher by profession. She is the daughter of Mr. W. S. D. Lockwood, O.B.E., a director of Sir W. G. Armstrong Whitworth Aircraft, Ltd. Miss Lockwood joined the Volunteer Reserve as a cadet pilot in May 1951.

"Flight" photograph

LIKE A BAT OUT OF— (though actually at a modest rate), Tom Brooke-Smith swings the Short Sherpa research aircraft past the camera on the occasion of the demonstration described in our previous issue. After present introductory limitations are removed the Sherpa will provide control and stability data up to about 250 kt in a shallow dive.

Rolls-Royce A.T.C. Scholarships

THE Air League announces that Lord Hives, chairman of Rolls-Royce, Ltd., has presented two flying scholarships for A.T.C. cadets. One will be open to cadets of No. 620 (Rolls-Royce) Squadron, A.T.C., and will be named the Lord Hives Scholarship; the other, the Rolls-Royce Scholarship, will be for the whole of No. 64 Group, in which No. 620 is included. The Air League expresses the hope that others may follow the example of Lord Hives, Lord Sherwood and Mr. R. A. Mitchell of Belfast, all of whom have financed flying scholarships. The cost of a scholarship averages about £145.

Indian Test Pilot's Death

CAPT. NAMJOSHI, chief test pilot of the Hindustan Aircraft Factory at Bangalore, lost his life last week in a runway crash whilst testing one of the company's trainers.

A Plastics "Annual"

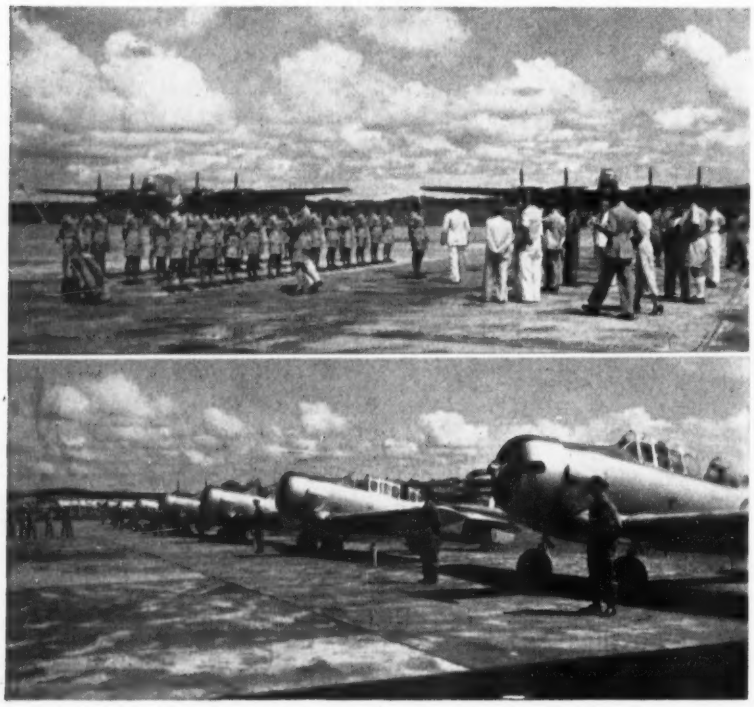
THE British Plastics Exhibition, now established as a biennial event, will next be held at Olympia, London, from June 1st to 11th, 1955. As in former years, a convention will be held concurrently. The exhibition is organized by *British Plastics*.

The Jubilee at South Kensington

"SIXTEEN large, and in some cases dramatic, photographs emphasizing the many hazards faced by the early aeronautical pioneer" are among the exhibits at the powered-flight jubilee exhibition organized by the Science Museum, South Kensington. Opened last Tuesday, December 15th, the exhibition will remain open for three months (10 a.m.-6 p.m.; Sundays, 2.30-6 p.m.; closed on Christmas Day).

For Recognition Teams

THE Aircraft Recognition Society is to hold its seventh All-England Recognition Competition in the lecture theatre of the Royal Institution, London, at 2.15 p.m. on Saturday, January 23rd. Principal awards are the Silver Hurricane Trophy (team with highest aggregate), Silver Heracles Trophy (best A.T.C. or C.C.F. team) and *Air Pictorial Trophy* (best individual score). Entries close on December 31st; forms are obtainable from the Hon. Secretary, Aircraft Recognition Society, 39/40 Bedford Street, W.C.2.

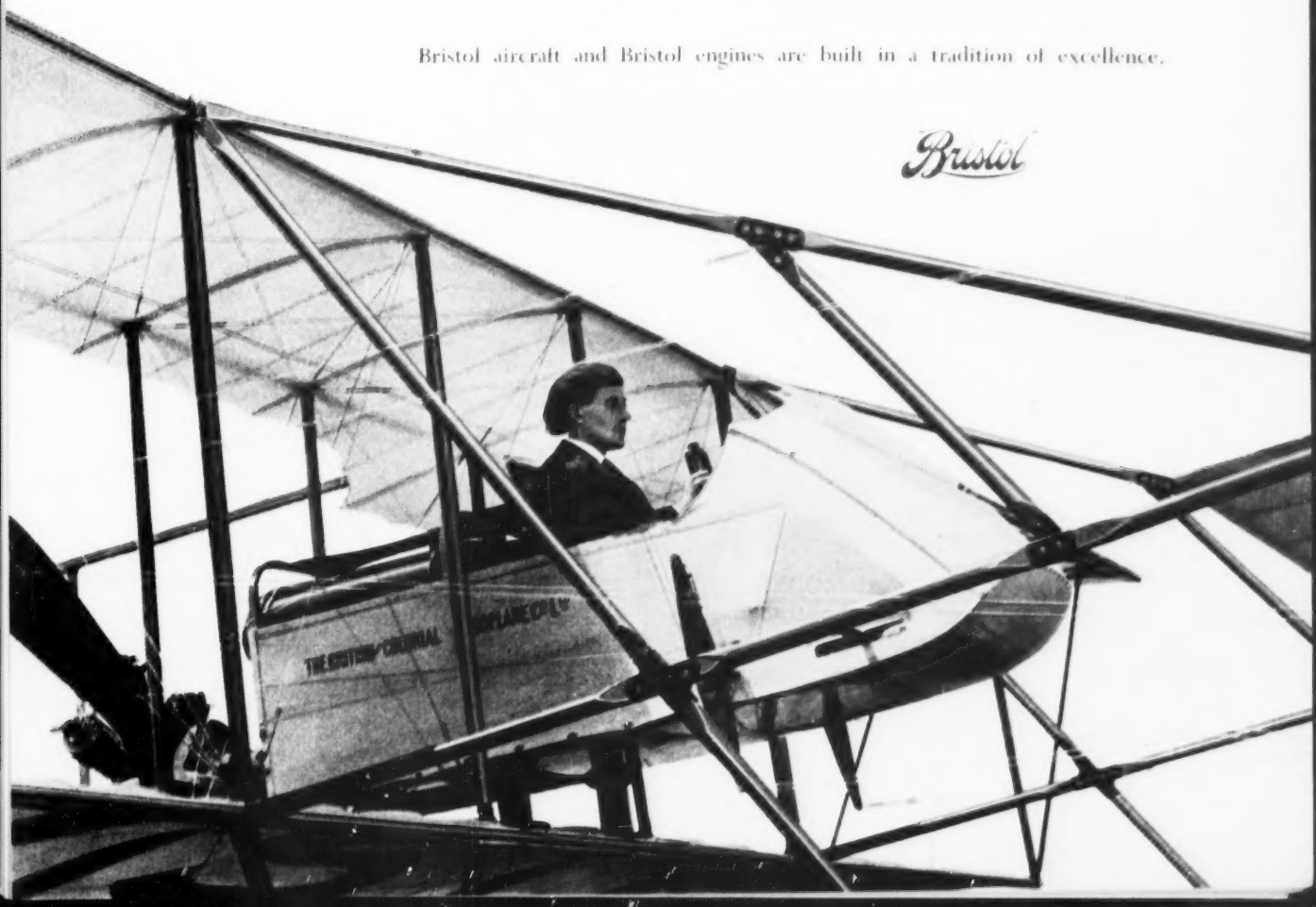


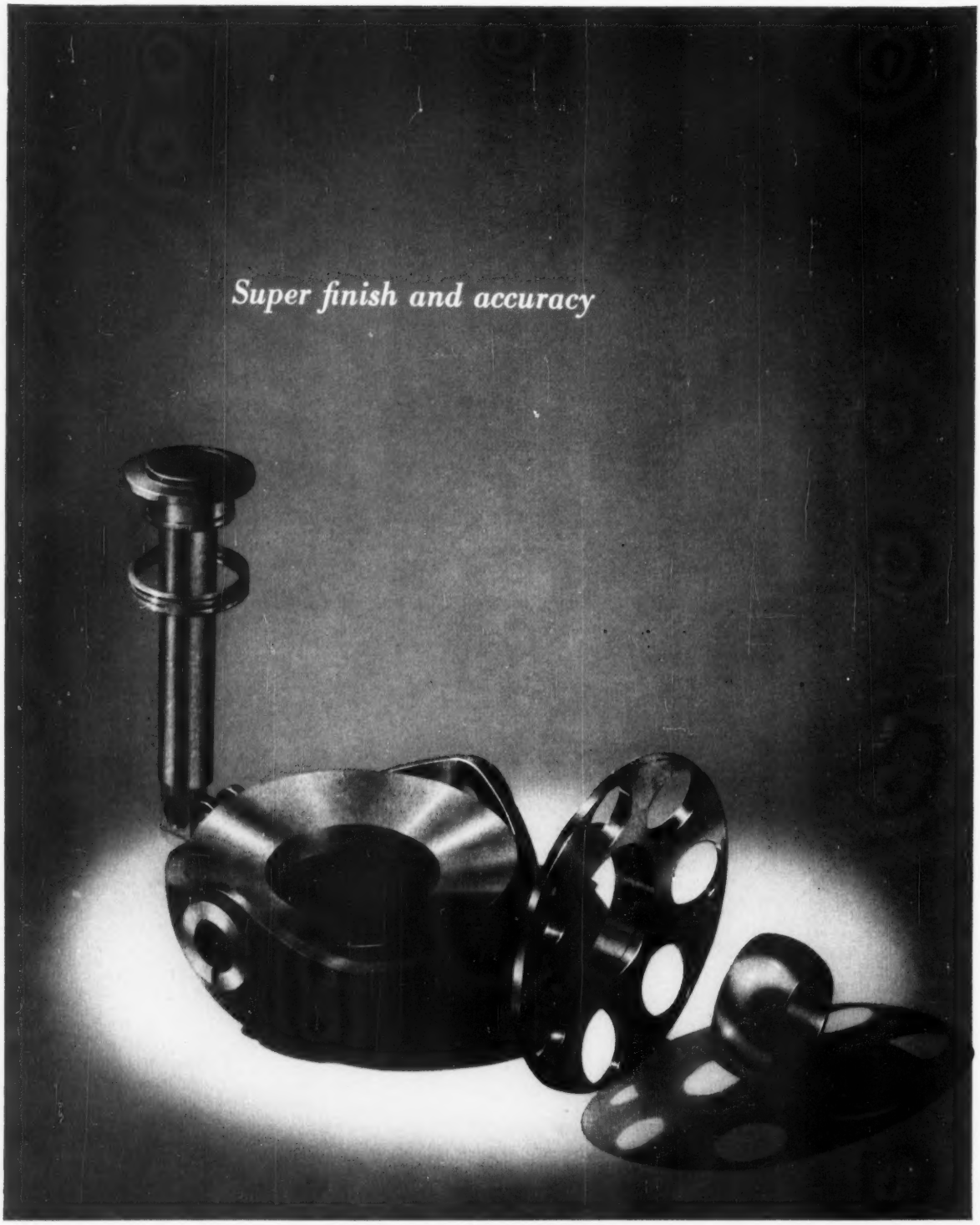
FAR-EAST AUXILIARIES: In the uppermost picture members of the Malayan Auxiliary Air Force are seen paraded before Avro Lincoln bombers of the R.A.A.F., standing by for anti-bandit operations at Tengah. Below is a line-up of spruce-looking Harvards. Another picture appears on page 826.

In 1910...

For more than four decades the Bristol Aeroplane Company has helped to lead the march of British aviation progress. The seventy-ton Britannia is a descendant of the 1,000 lb. Boxkite of 1910, just as today's Olympus turbojet and Proteus turboprop engines are the scions of a line of power founded with the 368 h.p. Jupiter in 1920. Bristol aircraft and Bristol engines are built in a tradition of excellence.

Bristol





No. 5. These components, of extreme dimensional accuracy and super finish, are the operative parts in varying the delivery of the self governing high pressure fuel pump.

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ALL-WEATHER LANDINGS

Air and Ground Research by the Blind Landing Experimental Unit

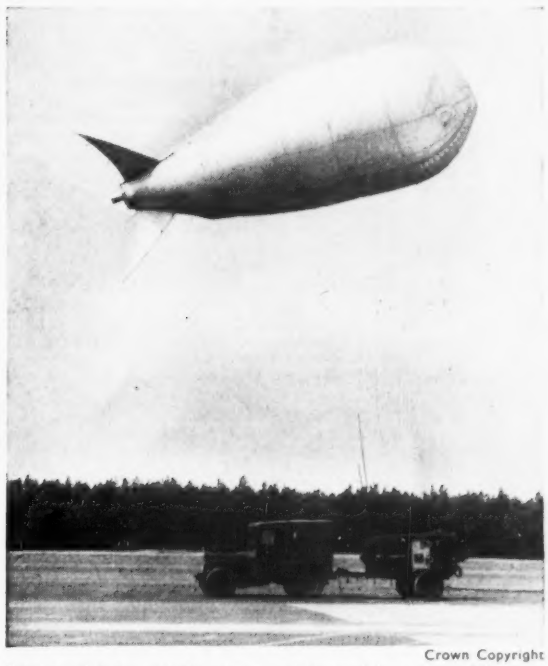
By W. MAKINSON, M.Sc., A.M.I.E.E.

TOO often, and sometimes tragically, one is reminded of the dangers of all-weather flying, especially during the critical period of approach and landing. In civil airline operations, where the safety and comfort of passengers is all-important, the acceptable weather minima thus determined set standards which in this country have involved the Corporations in financial loss. In particular, fog, by day or night, frequently disorganizes scheduled flying and, as demonstrated last winter, may suspend air traffic for long indefinite periods.

In war no such option may be available. As in this atomic age the British Isles become increasingly vulnerable to devastating air attack, it is obvious that military air movements can accept no arbitrary cancellations. Means must be found of operating aircraft under all possible weather conditions.

This briefly gives the background to the basic problem facing the Blind Landing Experimental Unit, formed by the Royal Aircraft Establishment in 1945 with the terms of reference implicit in its title. At that time contemporary advances in radio navigational aids and automatic pilots encouraged an all-out attack, aimed at making the process entirely automatic. By 1949 this ideal appeared to be at least in sight. Approximately five hundred landings had been made at Woodbridge in a specially equipped aircraft during which, from the start of the approach to the completion of the landing run, only such functions as the operation of throttles, flaps, brakes, etc., had been left to the human pilot. The system was not perfect; but the practicability of automatic landing had been proved and a useful guide obtained as to the penalty likely to be exacted, in weight and complexity, by equipment incorporating the necessary refinements.

Whilst these experiments were in progress, other workers—notably E. S. Calvert at Farnborough—were making a flanking attack on the same problem by introducing radical improvements to the airfield lighting systems, leading to the now familiar centre-line and cross-bar pattern of approach lights. In conjunction with high-intensity runway lighting, this system is believed to provide the essential elements of visual guidance required in both horizontal and vertical planes for manual landing, provided that the visibility is such that a sufficiently large extent of the pattern can be seen from the air during the manœuvre.



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Capable of being quickly raised and lowered by a powerful winch, this small balloon permits instrument-recording of air-to-ground visibility measurements without the need for sending up an aeroplane.

Crown Copyright

Clear-weather interlude at B.L.E.U.: Approach-path data being recorded by a ground observer with the aid of a Viking.

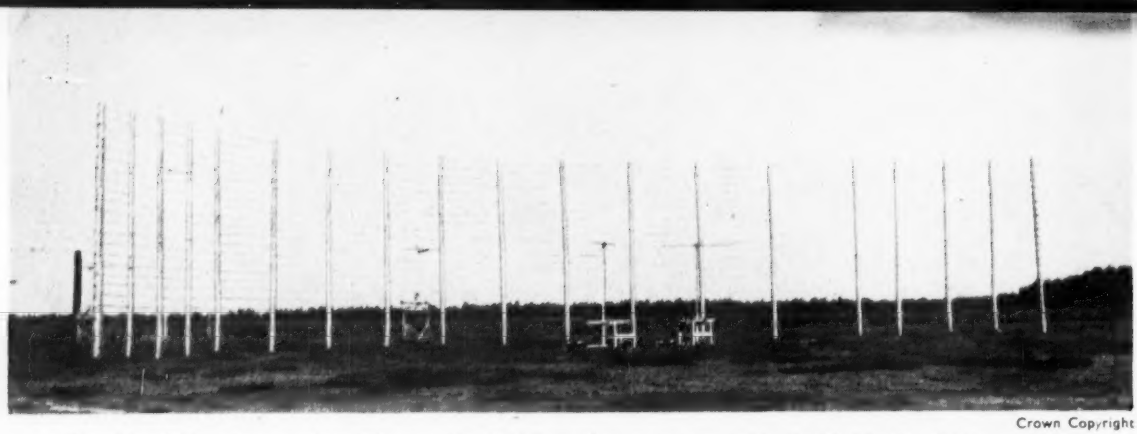
THOUGH the existence of the R.A.E.'s Blind Landing Experimental Unit is well known, little is ordinarily heard about its work. In this article, its superintendent describes current investigations being made at the Armament and Instrument Experimental Unit, Martlesham Heath, Suffolk. The research involves flying in the worst of weather and, as the author states, one of the pilots has been awarded an A.F.C. in recognition of his work. Mr. Makinson points out that the views expressed are his own, and do not necessarily reflect those of the Air Ministry or M.o.S., who have given permission for their publication.

As this method requires no additional airborne equipment it is attractive economically. But, as the spread of the ground lighting pattern must obviously be limited, it is essential that, during operation in low visibilities, means should be provided whereby a blind-flown aircraft can be brought accurately and without difficulty within the effective visual range of the lighting pattern, and in an acceptable configuration relative to the runway in use. At present a proportion of the scientific effort is being devoted to this more limited objective and to a study of the factors which will then decide the overall operational value of such a composite method—i.e., the determination, for any class of aircraft, of the limiting weather conditions in which safe landings will still be possible. On the results of this investigation the strength of the case for a truly blind landing system must depend.

Approach Methods.—The basic radio approach aid is the instrument landing system, the specification of which is subject through I.C.A.O. to international agreement. For military use, certain simplifications and improvements have been introduced as a direct result of the Unit's work in this field, notably the introduction of a narrow beam localizer aerial system to minimize siting effects, with the option of "offsetting" the beam where territorial considerations preclude the use of the normal centre-line installation.

The I.L.S. facility provides, in both horizontal and vertical planes, overlapping beams of coded radio-frequency energy from which radio receivers in the aircraft derive currents proportional to the angular position-errors subtended at the localizer and glide-path origins respectively. These error currents may be presented to the pilot on a single instrument indicating the displacement of his aircraft from the ideal approach path in the two planes, enabling him to take corrective action. Provided he can achieve and maintain this path sufficiently closely he should be brought into a position from which a successful landing can then be completed visually.

The difficulty of "flying the needles," which provide displacement information only, will be fully appreciated by anyone who has driven a car in fog when only the near-side kerb immediately adjacent to the vehicle is visible. To prevent the pilot making an oscillatory approach, some anticipation (or an appreciation of the rate of closing the beam) is required. This rate term, given a perfect beam, could be inferred from the velocity of movement of the I.L.S. needle but, in azimuth, radio beam distortion (beam bends) caused by siting effects will introduce short-



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Ground installation of an experimental "narrow-beam" I.L.S. localizer system operated by the Blind Landing Experimental Unit.

ALL-WEATHER LANDINGS . . .

term errors which may have a destabilizing effect. A more reliable rate term can be inferred from the relationship existing between the actual aircraft heading and that required, allowing for drift, when tracking parallel to the runway centre-line. In practice, experienced pilots will fly a mixture of heading and I.L.S. information.

To assist the pilot in making the necessary mental calculations and thus to achieve accurate approaches, various methods of simultaneous presentation of I.L.S. and rate information have been devised in which the desired flight path, or even the ideal aircraft attitude required to achieve this path, is automatically computed. These devices are known under the generalized title of "couplers." In its most advanced form the coupler feeds I.L.S. and attitude information, using the appropriate transfer functions, into the autopilot, thus constituting an automatic approach system. In this case the pilot, having adopted the appropriate landing configuration, merely selects the approach facility required and maintains his air-speed at a specified value, taking over from the autopilot when he wishes to "go visual" and land or overshoot manually.

The assessment of the accuracy of the different approach methods is being investigated by the Unit in full-scale tests, during which the aircraft position in the two planes, at different ranges from the threshold, is recorded photographically. Subsequent analysis of the records enables a figure of merit for performance to be assigned. The criterion of "approach success" adopted can conveniently be quoted in terms of the lowest height on the glide path from which the instrument approach could ideally be converted into a successful landing in every case without exceeding specified safe manœuvring and terminal limits.

In all cases so far investigated it has been found that, provided an appropriate air-speed has been specified, behaviour in azimuth is the limiting factor. Where instrument approaches are being examined arrangements are made for the pilot's view to be suitably obscured; on these occasions a safety pilot with dual control takes over at an appropriate time to overshoot or land.

It will be apparent that, whichever coupler is used, there will be a manual phase of the approach during which the pilot will be adapting himself from instrument (or automatic) to visual flying. This finite period, known as the "transition," will be an important one, since during this time the aircraft is virtually without guidance. Sufficient time must also be available, once the transition is complete, for the pilot either to flare out and land or to overshoot safely; and the minimum acceptable visual range of the lighting pattern defining the weather limits is therefore dependent to a great extent on the ease with which the transition can be made.

Although the tests are still incomplete it appears probable that the potential accuracy of the more erudite I.L.S. couplers will not vary very greatly from one to another or from that obtainable with good G.C.A. If this is so, the choice of coupler will depend mainly on the relative ease of transition, which will again be influenced by the effort called for from the pilot and his degree of confidence during the approach. The method of presentation adopted for monitoring the approach accuracy, as distinct from that required to fly the beam, may well be important.

Visibility Experiments.—The complementary part of the problem is concerned with the efficiency of the approach and runway lighting systems in all weathers by day or night. This has involved the Unit in a unique series of flying experiments, carried out over the last three winters. A Devon aircraft fitted with automatic approach equipment was flown as a test vehicle to assess the range and effectiveness of the approach lights as seen from the glide path during the landing manœuvre. This had to be done at all hours and under the worst possible conditions, including ice and snow, owing to the impracticability of inducing sufficiently "natural" effects on a large enough scale.

Landings carried out under these conditions have yielded valuable information about the extent of approach and runway lighting and/or marking which must necessarily be visible in order to define the ground plane without ambiguity. In addition it has been proved beyond doubt that, if the maximum use is to be made of the approach aids and lights, it will be necessary to devise some means of forecasting the slant visual range on the approach as seen from various heights on the glide path, using this criterion to specify the operating limits rather than the more usual meteorological parameters of cloud base and visibility. Fortunately, it has been found possible to correlate the range of the lights as seen from the air with measurements of the visual range of a light flown from a balloon on the glide path as seen from the ground. This balloon was capable of being raised and lowered quickly by a mobile winch; and the method, which obviates the use of aircraft, has therefore been recommended as a sub-standard for further meterological investigations. No correlation was, however, obtained in these experiments between the horizontal visual range at ground level and the slant visual range, owing to the non-homogenous nature of fogs or clouds near the ground. A practical method of obtaining slant visual range directly may therefore have to be devised.

On one occasion during these tests the pilot saw nothing during his landing until he was down to a height of only 70ft. At that time, when the meteorological visibility at ground level was of the order of only 35 yd, the nearest diversion airfield was Prestwick! Needless to say, on such occasions the generous expanse of the Woodbridge runway (250 yd wide by 3,000 yd long) is a comforting thought. Naturally, every precaution has been taken to provide the airfield with emergency landing equipment. In addition to a complete stand-by microwave I.L.S. system (air and ground) a precision radio altimeter is fitted, with a "flare-out" instrument on which the pilot can (and does) land completely blind if necessary. It is of interest to note that, in recognition of his work in this field, the pilot of the Devon (S/L. R. C. Everson) was awarded the A.F.C. last January.

Future Tasks.—A detailed study of the mechanism of transition is proposed in order to establish the second criterion of coupler performance. Although full-scale experiments will continue, use will also be made of action-speed simulator techniques.

Such methods may be attacked as lacking in realism, particularly when applied to that part of the manœuvre where subjective effects and emotions are obviously important. On the other hand, experiments devoid of risk can be extended considerably in scope and the rate of collection of data enormously increased. The use of such a simulator in the evolution of approach lighting systems was found to be invaluable.

Unless there are fundamental changes in aircraft design, the present tendency towards ever-increasing approach and landing speeds may swallow up improvements in couplers without reducing limits so long as landings have to be completed manually with visual guidance. Although the situation may be eased temporarily by the introduction of dispersal systems such as Fido, it is possible that only by eliminating the direct visual part of the landing will weather be completely defeated. This will require either a reversion to the fully automatic landing techniques or the development of a system which will replace for the pilot, with sufficient detail and realism, the essential aspects of the visual world otherwise denied to him. Both these possibilities are receiving attention as research items.

HELICOPTER ASSOCIATION JOURNAL

MANY of the papers published in the quarterly *Journal* of the Helicopter Association have become standard reference-works. As a number of the 24 issues are now out of print, the Association are considering the possibility of reproducing the whole series in the form of three bound volumes for sale at £5 each, a price in line with those of individual back numbers. Before taking this decision, however, the Association wishes to assess the probable demand, and those interested are requested to advise the administrative editor, Mr. C. Colin Cooper (at the Helicopter Association of Great Britain, Londonderry House, London, W.1).

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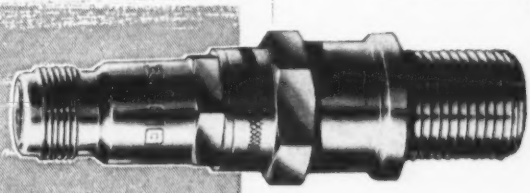

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INTEGRAL EXPERIMENT

Short Brothers' Spar-box Project Described in an R.Ae.S. Section Lecture

THE section lecture at the Royal Aeronautical Society on December 1st, entitled *Integral Construction: A Survey and an Experiment*, was given by Mr. K. L. C. Legg, D.C.Ae., B.Sc.(Eng.), who is assistant designer (structures) at Short Brothers and Harland, Ltd. The experiment referred to was the manufacture of a spar-box structure employing integral construction (on show at Farnborough this year), and Mr. Legg's description is reproduced in slightly abridged form below, together with a brief summary of the remainder of his paper.

In the first part of his lecture, Mr. Legg outlined some major advantages of integral construction. These were an inherent stability in compression due to the intrinsic solidity of forged, extruded or machined sections; a considerable reduction in the number of parts and the amount of paper work, with an overall saving in cost; a weight saving of up to 4 per cent of the aircraft total weight; good resistance to fatigue; high surface-finish; and suitability for integral fuel tanks. Against these factors had to be weighed the considerable manufacturing difficulties to be overcome, and overall economic considerations.

The lecturer went on to discuss in detail the various methods of producing integral construction, dealing in turn with forging, extruding, machining, casting and rolling. Forging methods appeared to offer the best design advantages but were the greatest distance away. Extrusions might provide an interim usefulness, while extensive machining methods existed already. From the economic point of view, the high initial financial outlay was justified by the complementary needs of optimum military aircraft performance and economy in civil aircraft production.

After discussing limiting size requirements, Mr. Legg described the problems, achievement and future requirements of the forging, extruding and machining processes, and then referred to optimum structural efficiency, and design trends and the relation to practical forms of cross-section. It appeared that integral construction showed a worthwhile advantage over riveted or glued skin-stringer construction for the type of high-performance aircraft being built or designed and that this advantage became greater as wing-depth decreased and speeds increased. There was a structural trend from skin/stringer construction to stiffened skin and hence to a simple thick skin involving the use of multi-webs.

In order to investigate the advantages and the difficulties of the use of integral construction, it was decided to manufacture a spar-box structure using this method, to be compared with the existing spar-box of the Short S.B.5. To complete the exercise a strength test under representative fully factored aircraft loads was conducted, so that the project provided a direct comparison with an existing riveted skin/stringer spar-box. The upper and lower surfaces of the test specimen were integrally machined, and conventional spar webs and ribs were employed.

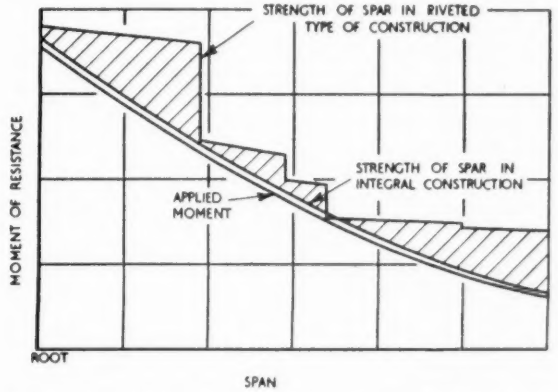

Fig. 2 A comparison of spar strengths using riveted and integral construction. One source of weight-saving in the integral method is obtained by conforming more closely to minimum sectional requirements (straight tapers being used to facilitate machining).

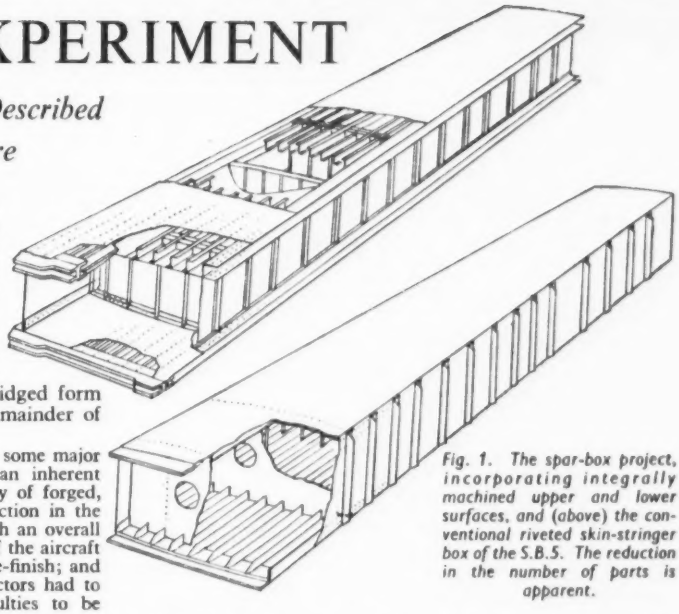

Fig. 1. The spar-box project, incorporating integrally machined upper and lower surfaces, and (above) the conventional riveted skin-stringer box of the S.B.5. The reduction in the number of parts is apparent.

Unflanged stiffeners were adopted, in view of the required spanwise taper of the skin thickness and stringer thickness, height and spacing. As the depth of the wing was small, this method was not structurally inefficient.

The box was 120in long and 22in wide at the root, tapering to 13.5in at the tip. The overall depth was constant at 10in and

Weight

Item	Weight lb	
	Riveted	Integral
Upper-surface:—		
Skin	33.97	57.50
Stiffeners, channels	42.08	
Reinforcing brackets	2.09	
Nuts, bolts, rivets, etc.	13.32	0.60
Total—upper surface	91.46	58.10
Lower-surface:—		
Skin	33.97	50.90
Stiffeners, channels	33.59	
Reinforcing brackets	1.48	
Nuts, bolts, rivets, etc.	8.76	0.60
Total—lower surface	76.80	51.50
Ribs	11.52	13.78
Front and rear webs	31.60	36.26
Total (complete box)	211.38	159.64

Number of Parts

Item	Riveted	Integral
Upper skin	2	1
Lower skin	2	1
Stiffeners and channels	44	—
Reinforcing brackets and attachment angles	348	—
Spars—flanged web sheet	6	2
Web stiffeners	22	36
Ribs	13	11
Rib-stiffening and attachment angles	67	233
Bolts, nuts, washers	3,009	—
Rivets	7,064	2,851
Total	10,577	3,135

Estimated Cost of Production

Item	Riveted		Integral	
	Labour cost £	Material cost £	Labour cost £	Material cost £
Assembly of spar box	700	8	460	5
Upper surface	800	46	360	95
Lower surface	800	46	360	95
Ribs	220	5	195	18
Front spar	62	6	56	6
Rear spar	62	6	56	6
Details	77	3		
Totals	£2,721	£120	£1,487	£225
Estimated total cost	£2,841		£1,712	

Summary of savings (per cent): Weight, 24.6; number of detail parts, 43.7; number of attachments, 71.7; cost, 39.8.

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the outside surfaces had a constant contour conforming to aerofoil section. The skin thickness tapered linearly from 0.275in to 0.056in, the stringer thickness from 0.140in to 0.055in, the stringer depth from 2in to 0.8in and the stringer spacing from 2.75in to 1.678in. The root ends of the planks were flared out to provide a multi-bolt wing root attachment and this was reproduced at the tip ends to facilitate test-rig attachment.

An analysis of weight, number of parts and cost in comparison with the conventional riveted construction was then given by the lecturer, and is reproduced on page 807. The figures were based on actual experience with both forms of construction and it was estimated that the use of integral construction could effect a production cost saving of 39 per cent, based on 50 aircraft (i.e. 200 machined planks).

The major part of the work involved the machining of the planks. The manufacture of the upper compression surface was next dealt with in some detail by the lecturer. The lower surface was slightly different dimensionally but was manufactured by identical methods.

The sequence of operations, planned to minimize distortion, was as follows: (1) Skin-breaking on the original billet. (2) Cutting to rough shape on the band-saw; the cut-away pieces were used for material control checks during the various stages of heat treatment. (3) Thickness tapering. (4) Contouring. (5) Rough machining of the stiffeners and skin. (6) Stress-relieving heat treatment. (7) Final machining of the stiffeners and skin. (8) Final machining of the end attachment. (9) Final age-hardening heat treatment. During these operations close inspection checks were made at frequent intervals to check the distortion level and machining accuracy.

The blank rolled billet was supplied by the Northern Aluminium Co., in a stretch-levelled, solution-treated condition. The stretching operation was considered necessary to provide flatness and a more homogeneous metal-flow in order to control and minimize the distortion. The billet was 2ft wide, 10½ft long and 2½in thick and was in D.T.D. 603B material which, after age-hardening, conformed to specification D.T.D. 646. In this condition figures of 27 tons/sq in (ultimate), 21 tons/sq in (proof) and 5 per cent elongation were guaranteed throughout the plate. Subsequent control test-specimens showed that these figures were completely met and, in the outer skin, exceeded. The degree of flatness was remarkably good, but it was found necessary to exercise considerable care in the storage-support of the plates, which tended to creep under their own weight.

Three billets were ordered, each weighing 679 lb. Subsequent achievement showed that the precaution of the extra billet was entirely unnecessary. The skin-breaking operations simply removed the outer 1/16in skin and provided surfaces for subsequent operations. Rough cutting to shape was performed with the band-saw. Clamping lugs were provided for machining purposes while the plate was still solid, and the removed portions were utilized for control test-specimens to determine the longitudinal and transverse properties in the billet.

The overall thickness taper (i.e. web height) was effected on a Stirk planing machine, the plate being held down by clamping lugs. To maintain symmetry, and hence to minimize distortion, taper was machined on both sides about the plate centre-line. This proved to be a wise precaution, as after one side had been machined a considerable bowing occurred; it disappeared when the remaining side was machined. Hardwood angular blocks were used to set up the required taper.

The same planing machine also produced the aerofoil contour. Hardwood blocks were again used to set the surface to be contoured in a horizontal plane, and contouring was effected by modifying the traversing-head toolbox of the planing machine to follow a copy-bar machined to the required male profile. Thus the cross-feed automatically gave correct lift with each stroke. The tool used for the finishing cut was of the button type which produced an excellent finish and required practically no surface dressing.

For the rough milling and subsequent operations to form the webs and skin it was considered necessary to employ a suction bed for clamping purposes. This bed, shown in Fig. 3, was made with a soft "Remax" top-plate and was contour-machined in a similar manner to that previously described, with the exception that the female copy-bar was employed. The reverse contour so produced provided the bed surface on which the contoured billet could rest. The top-plate was drilled with 200 small holes, interconnected by shallow grooves, which led into a sealed vacuum chamber. The chamber was exhausted by a 5 h.p. air-cooled vacuum pump capable of maintaining 29in of mercury—an effective 13.5-ton clamping-force. This bed also served as an indexing jig providing longitudinal angular movement for machining the tapered stiffener spacing. A number of experiments were effected with thick sheets to determine the holding-down power of the suction bed and they indicated that adequate suction was available to hold down the actual planks.

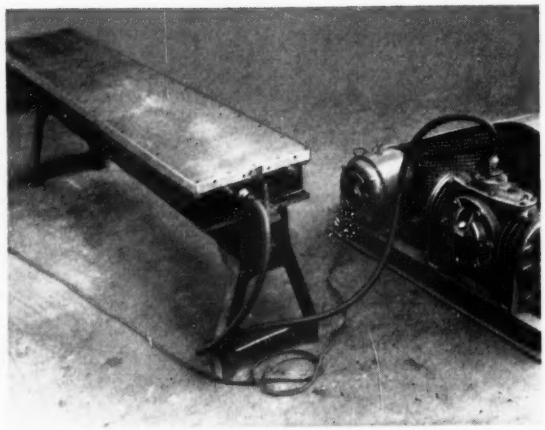

Fig. 3. The contoured suction-bed used used to hold the billet during rough milling and final machining. The soft "Remax" top plate has 200 small holes, interconnected by shallow grooves and leading to a sealed vacuum chamber.

During the rough-machining operation, on a Wadkin spar-mill, to form the stiffeners and skin, the clamping lugs were still utilized to guard against sudden failure of the vacuum pump during machining, and all the edges were sealed to reduce leaks. The machining of the various channels was carried out progressively from the centre of the plank, indexing being necessary after each machine traverse to provide stiffener-spacing taper. At this stage it was found that, owing to hollow spots and probable minor leaks, only 22in of mercury could be maintained from the suction pump. This was rather worrying, as the existence of hollow spots would reduce machining accuracy. It was thought, however, that as the thickness of material was gradually reduced the plank would automatically pull down. This, in fact, occurred and the hollow spots disappeared during final machining, the vacuum gauge then increasing to 28.5in of mercury.

Roughing-cuts reduced the billets to within ¼in finished size and the next stage was the stress-relieving heat treatment. It was considered necessary to finish-machine in the actual or near solution-treated condition and then to age-harden in order to avoid possible machining cracks.

Before final machining, however, it was desirable to release any locked-up stresses induced by the removal of the massive elements of material during rough machining. Since the release of such stresses is largely governed by temperature and not time, a stress-relieving operation was possible whereby the component was raised to the age-hardening temperature as quickly as possible, and rapidly cooled after a very short soaking-time. After this treatment the material should then still be in the required solution-treated condition for final machining. It was thought that probably 90 per cent of the total machining distortion would have occurred during this operation, as final machining would remove only a relatively small amount of metal. Also, since the material would still be in the solution-treated condition, large distortions could be corrected by cold working, or small distortions removed during final machining.

During the stress-relieving operation it was considered necessary to constrain the plank between rollers, in an attempt to confine the nature of the distortion to longitudinal bowing and to minimize cross-sectional distortion. Control test-specimens were included and these showed that, after the stress-relieving treatment on the first plank, parts had been fully aged in half an hour or so at temperature. On the second plank the time was reduced to about ten minutes and lower strength-properties were indicated; but in no case had solution-treated properties been retained. However, as there was no measurable cross-sectional distortion and a bow of only 0.35in in 10ft, it was decided to continue with the final machining of the stiffeners and skin.

Final machining was again effected on the Wadkin spar-mill, using the suction bed—which, incidentally, easily provided the necessary suction to pull out the small bowing previously mentioned. There was no appreciable increase in the bowing previously experienced and it was quite easy to straighten the machined plank by thumb pressure. Finally the ends were machined on a piano-mill and the complete plank artificially aged, the same constraining rig being used as for the stress-relieving operation. An inspection survey of the completed plank indicated that a general machining tolerance of $^{+0.004in}_{-0.001in}$ had been achieved, with a maximum of $^{+0.009in}_{-0.002in}$. This was rather more than the ± 0.002in called for, and most of the increase was traced to

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machining deviations on the suction-bed surface. However, as the weight agreed closely with the estimate and the strength was subsequently proved, the achievement was quite satisfactory for a first effort—although better accuracy must, and would be, obtained in production.

With the experience gained on the first plank, the second was produced much more quickly, and it was equally satisfactory. The two machined planks were riveted to the diaphragms and front shear-web, and the box closed by Chobert-riveting the rear shear-web.

It should be added that, by reason of the inconclusive nature of the torsional-instability tests, it was decided to attach the machined stiffeners to the diaphragms by small brackets. This increased the weight, the number of detail parts and the assembly time, but was considered a necessary precaution at this stage of experimentation.

During the testing of the spar box, maximum fully factored aircraft loads were applied to the structure through a 30-ton hydraulic jack and a linkage system picking up on the spar-web stiffeners. The whole structure under this loading was stressed uniformly throughout, with very slight peak stresses about two bays out from the root. This latter section was well strain-gauged and structural distortion under load was measured from deflection scales with remote-reading dumpy levels.

Failure occurred on the tension side of the box at 97 per cent ultimate load, the explosive report caused by the release of so much strain energy being acclaimed as one of the finest so far achieved in Short Brothers' testing history. Failure occurred first at the tip, through the diaphragm attachment rivet line. An almost simultaneous, but secondary, failure occurred at the root, again on the tension side through the diaphragm attachment rivet line. This form of failure was not unexpected, owing to the fact that the necessary modification of attaching the machined stiffeners to the diaphragms had reduced the effective tensile area and had been cleared on strength only because control test-specimens indicated the material to be above specification figures. Contributory factors to failure were the stress-concentration effects at the diaphragm rivet lines and the existence of small local-fixation moments at the tip and root attachments to the test rig.

What was more significant, however, was that the comparison surface showed no sign of skin buckling at 95 per cent ultimate load, while strut-bowing between ribs, which had undoubtedly commenced, was not severe. Strain-gauge readings indicated a reasonably uniform stress distribution across the upper and lower machined surfaces but the stresses were lower than those calculated.

The main conclusions from this experiment, said Mr. Legg, could be summarized as follows:

(1) Relatively low area integral construction of the order of 20-40 sq ft could be manufactured economically in this country, using existing machine tools and equipment.

(2) The weight-saving estimate over an existing fabricated construction was shown in practice to be realized as indicated by the satisfactory strength-test.

(3) Unflanged-section stiffeners behaved extremely well in compression and indicated that for this type of box practically an optimum efficiency structure was achieved.

(4) The cost estimate as reflected in machining time in production was reasonably substantiated.

(5) The surface finish was excellent.

In conclusion, the lecturer emphasized that the project was primarily an experiment to investigate the advantages claimed for this type of construction. He did not suggest that the manufacturing techniques or the types of machine tool employed were the best possible from a production viewpoint.

ASPECTS OF COMBUSTION

Wide Field of Study Covered by Lectures at Third AGARD Meeting

THE third meeting of the Advisory Group for Aeronautical Research and Development (AGARD) took place in Cambridge from December 7th to 11th, and on this occasion a number of papers were read, all dealing with various aspects of the subject of combustion for propulsion. They were the work of members of the Group's combustion-research working panel.

Brief summaries of some of the papers are given below (others will be summarized in a future issue), but first it will be appropriate to review briefly the functions and status of AGARD. The Group was formed in 1951 following a recommendation of the chairman of the U.S.A.F. Scientific Advisory Board to the Standing Group of the Military Committee of NATO. All the delegates who attended the first meeting (February 5th-9th, 1951) agreed that in the present world situation there was an urgent need for co-ordinating to mutual advantage the scientific and technical skill, manpower and facilities of the NATO nations. Realizing that scientific achievement would play a major part in any future conflict, they decided that an effort was "required to derive the greatest benefit from the total resources that are available." The Group was therefore constituted as a subsidiary organization of the NATO Standing Group with headquarters in Paris.

The objects of the Group are: (1) to review continuously the application of advances in aeronautical science to common defence problems; (2) to make recommendations for the solution of problems referred to it by agencies within NATO, including evaluation of research and development projects submitted by individual nations; (3) to make recommendations leading to improved co-operation among member nations in the field of aeronautical research and development; (4) to explore methods for facilitating exchange of information pertaining to aeronautical research and development. Following a recommendation of the first AGARD general assembly, the AGARD executive committee established working panels in the following fields: combustion research, aero-medicine, flight test techniques and wind tunnels.

The AGARD secretariat has its offices at Palais de Chaillot, Paris XVIe.

The second meeting of the Group was held in Paris during the period May 19th-21st, 1952. The primary objective on that occasion was to decide in which fields and on what specific subjects within those fields the initial effort of AGARD should be concentrated. The third meeting was that held recently in the Engineering Laboratory at Cambridge University and, for the benefit of those wishing to obtain copies of the papers, the following brief summaries will give an indication of their scope.

The Combustion of Double-base Propellants, *by Gordon K. Adams and Leonard A. Wiseman (Explosives Research and Development Establishment, Waltham Abbey, Essex).*—The complexity of the problem of the combustion of double-base propellants suggests that it is more profitable to consider the combustion of the simpler liquid nitric esters. The available combustion data on pure liquid nitric esters and their vapours are discussed, together with the properties of mixtures of nitric esters, with each other, with other compounds and with nitrocellulose. Some relations between rate of burning, chemical structure and heat of explosion are brought out. Some similarities are shown to exist between the combustion behaviour of double-base compositions and mixtures of liquid nitric esters. The chemical nature of the combustion process in liquid nitric esters is discussed.

Use of Spectroscopy in Elucidating Reaction Mechanism, *by A. G. Gaydon, F.R.S.*—The need for quantitative rather than qualitative spectroscopic work is stressed, and the difficulties in making experimental observations and in interpreting the results are discussed in relation to emission and absorption spectra. Recent experimental developments—low-pressure flames, atomic flames, use of deuterium flames—are reviewed. The information to be derived from electronic, vibrational and translational intensity anomalies and also from predissociations and continuous spectra are examined.

The mechanism of formation of C_2, CH, OH and HCO radicals in organic flames is studied, and spectroscopic evidence on the nature and meaning of activation energy in relation to flame propagation is discussed. It is suggested that observations of flame spectra could be interpreted as due to breakdown of the hydrocarbons, etc., rather than to the formation of partial oxidation products.

The Mechanism of Combustion of Solid Propellants, *by Richard D. Geckler.*—The normal linear burning-rate of solid propellants increases with (1) an increase in the pressure of the gases in contact with the burning surface, (2) an increase in the temperature of the solid propellant, and (3) an increase in the velocity of the combustion gases parallel to the burning surface. Experimental data on these phenomena are summarized for both colloidal and composite propellants. An attempt is then made to show the relationship between the concepts and methods developed for the study of deflagration in gases and the theories of solid-propellant combustion. The present status of the theoretical study of solid-propellant combustion is reviewed, particular attention being given to the theories of Professor O. K.

ASPECTS OF COMBUSTION . . .

Rice and Professor B. L. Crawford, Jr. The values of various kinetic parameters deduced by the application of their theories to experimental burning-rate data are compared with values obtained in other ways.

A summary of experimental and theoretical information on unstable combustion is also given. The distinctive feature of this phenomenon is an abnormally high burning-rate that accompanies high-frequency pressure oscillations in rocket combustion chambers. It is concluded that the theoretical understanding of the combustion of solid propellants is insufficient to be of much practical aid to the propellant chemist seeking formulations with improved properties.

A Turbulent Flame Theory Derived from Experiments, *by Béla Karlovitz (U.S. Bureau of Mines).*—The structure of turbulent flames burning in explosive mixtures is described and illustrated by examples, and a theory of turbulent burning velocity is developed, based on this flame-structure. The cardinal point of the theory is the calculation of the time interval, during which a small proportion of the instantaneous combustion wave has statistical correlation with the random motion of a certain mass of gas. A comparison of measured values of the turbulent-burning velocity with the predictions of this theory points to the possibility of turbulence generation by the turbulent flame. The mechanism is described by which the turbulent flame can generate additional turbulence and a theory of this process is developed, which permits the calculation of the intensity of flame-generated turbulence. Turbulence intensities calculated from measured turbulent-burning velocity data are in good agreement with turbulence intensities calculated from this theory.

For an independent experimental test of both theories the direct measurement of the turbulence intensity in the flame will be necessary, and this appears feasible. A relationship is derived between the burning velocity, scale of turbulence, and the thickness of the turbulent-flame brush. Measurement of the flame-brush thickness by an electronic probe therefore gives information about the scale of turbulence in the flame. Further experimental work is required to complete the experimental test of the theory of turbulent flames, and to establish its range of validity.

The Problem of Combustion at High Altitude, *by Peter Lloyd (Deputy Director, National Gas Turbine Establishment, M.o.S.) and Brian P. Mullins (Head of Chemical Physics Department, National Gas Turbine Establishment).*—Combustion and relighting problems associated with aircraft gas turbine combustion chambers and jet-pipe reheat systems at altitudes up to 65,000ft are considered. Attention has been focused upon four engine operating conditions: "cruising" and "idling" when discussing combustion, "windmilling" when discussing relighting, and "full speed" when considering reheat. Representative test data under simulated flight conditions are given and these confirm the expectation that the adverse effect of low pressure and temperature on highly rated combustion systems is sufficient to cause a real deterioration in performance which is particularly serious in the cases of relighting and jet-pipe reheat.

Attention is given to the effect of altitude conditions upon the component processes: fuel atomization, mixing of gas streams, spontaneous ignition, spark ignition, flame propagation, droplet evaporation, heat transfer and chemical reaction rate. The effect of reduced pressure upon many of these processes is not known and their relative importance in combustion is not fully understood; in the authors' opinion this represents an area of worthwhile research.

Spectroscopic Studies of Premixed Laminar Flames, *by S. S. Penner (AGARD).*—A critical review is presented of the results obtained by spectroscopic observations on flames. The objective of the survey is to examine the status, promise and deficiencies of combustion spectroscopy in its relation to (a) elucidation of the mechanism of combustion and (b) the solution of technical combustion problems. Since important spectroscopic studies have been carried out on low-pressure flames, a discussion of the probable effects of pressure on laminar flame propagation is also included.

Combustion Instability in Liquid-Propellant Rocket Motors—a Survey, *by Chandler C. Ross (Manager, Liquid Engine Division, Aerojet-General Corporation, Azusa, California), and Paul P. Datner (Senior Engineer).*—Three different types of combustion instability in liquid-propellant rocket engines—the low-frequency "chugging," the high-frequency "screaming" and the low-frequency "divergent" type—are briefly described. The pertinent information available in the literature is presented, and the problems encountered in securing reliable experimental data on the phenomena, using conventional instrumentation, are reviewed. A discussion of low-frequency instability, resulting from the interaction of propellant feed system oscillations and combustion gas vibrations, is given, based on available test results.

Some data on high-frequency combustion oscillations are presented, indicating that the vibrations of the combustion gases correspond to the propagation of finite pressure disturbances in the combustion chamber, which appear to originate in the combustion zone. The modes of combustion gas oscillations of both high and low frequencies are described as similar to those of acoustic oscillations taking place in cavity resonators, and as maintained by the interaction between the rates at which propellants are consumed and fluctuations in combustion chamber pressure, resulting in strong reactive shock-waves. It is noted that combustion oscillations may be excited by disturbances of the random-noise type, inherent in the combustion, or by a shock such as a "hard start."

It is pointed out that all published theories on the phenomena agree on two principles: (1) The oscillations of combustion gases are maintained by periodic variations in the propellant consumption rate, resulting in a periodicity in the rate of heat release. All theories are based on Rayleigh's principle that vibration in a confined mass of gas can be maintained by periodic heat release if variations in heat release and in pressure oscillations are in phase, but that the oscillations will be impeded if the fluctuations in heat release and pressure are out of phase. (2) The significance of the combustion time-lag with respect to combustion instability is generally recognized, and the rocket engines under discussion are considered to be dynamic systems with delayed reaction because of this inherent time lag. It is shown that the Nyquist criterion of stability could be applied successfully for predicting the dynamic behaviour of rocket systems if sufficient data were available concerning the physical and chemical kinetics of the conversion of propellants into burned gases in the combustion chamber.

Combustion of a Single Droplet and of a Fuel Spray, *by D. B. Spalding (Department of Engineering, University of Cambridge).*—The physical and chemical aspects of liquid-fuel burning are shown to be capable of separate treatment. Considerable progress has been made in understanding the former aspect, and the burning rate of an isolated droplet can be predicated with acceptable precision if the natures of the fuel and atmosphere and of their relative motion are specified. The relative motion within a spray is, however, too complex to permit analysis as yet, and it is not even certain whether droplet burning or jet-mixing processes control the flame length in gas-turbine combustion chambers.

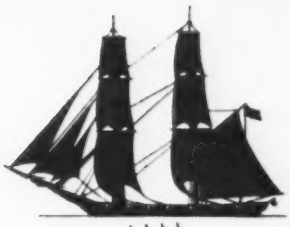
Knowledge of the conditions for the stable burning of liquid fuels is still less advanced, and is restricted to the laminar diffusion flame adjacent to a fuel surface. It appears that the extinction condition is related to the laminar flow speed but not to the spontaneous ignition characteristics of the fuel. The contribution to design of the fundamental knowledge obtained so far has been largely negative in character. More direct application of this knowledge is only likely if the design of combustion systems is so modified as to be amenable to analysis. In the present state of the art this means restricting the use of fuel sprays.

Diffusion Processes as Rate-controlling Steps in Laminar Flame Propagation, *by Dorothy M. Simon (National Advisory Committee for Aeronautics).*—Correlations between equilibrium concentrations of atoms and free radicals and laminar burning velocities of pre-mixed gases are reviewed. Such correlations exist for both non-hydrocarbon and hydrocarbon systems under conditions of changing composition, initial temperature, pressure and type of diluent. Critical examination of the physical significance of the correlations shows that diffusion effects do not usually give unique explanations of the experimental data and that, in general, an alternate correlation with a thermal mechanism of flame propagation may be devised. Also, it is clear that there are important limitations of the interpretations, such as the lack of chemical kinetic data, the use of simplified equations based on drastic assumptions, and the similarity between equations based on diffusion mechanisms. However, within these limitations and those imposed by the accuracy of measurement of burning velocity, two types of burning-velocity data—the effect of inert gases and the effect of the addition of water to combustible systems—slightly favour a diffusion mechanism over a thermal mechanism.

Other flame properties which may be influenced by diffusion are reviewed; namely, flame structure instabilities, limits of inflammability, quenching distance, minimum ignition energy and minimum ignition pressure. Neither does the use of flame properties other than burning velocity to resolve the mechanism of propagation provide any decisive evidence. It is probable that both heat conduction and the diffusion of atoms and free radicals contribute to flame propagation. In order to evaluate which process is more important in controlling the burning velocity under a particular set of experimental conditions, independently measured kinetic factors and well-established thermal properties are needed. If, however, reasonably good predictions of the effects of variations in experimental conditions on the laminar burning velocity of pre-mixed gases are desired, then simplified equations such as the Tanford-Pease equation or the Semenov equation containing empirical factors are useful.

(Further summaries will appear in a forthcoming issue)

Air Power at Sea



H.M.S. HERMES

The name *Hermes* for a warship goes back to 1796 when a brig-rigged sloop of 14 guns was captured from the Dutch as the Mercurius, and then re-named. The first aircraft carrier to bear the name served the Fleet Air Arm through its formative years and well into the second world war.

The new 20,000 ton Intermediate Fleet Carrier *Hermes* is of the new class equipped with 'angled deck' and steam catapult—these British inventions being the most important modern developments in deck flying. As with her predecessor, Fairey aircraft will be with the Fleet operating from the new *Hermes*.

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FAIREY

Powered by an Armstrong Siddeley "Double Mamba"

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de Havilland send greetings to
all their friends and wish
them a Merry Christmas and
a Happy and Prosperous
New Year

HOT-AIR WHIRLER: The S.O.1220 Djinn is a machine of which France can be justly proud. Powered by a Turboméca Palouste, it is the first really successful tip-drive helicopter. On the left is Djinn No. 01, while the other two photographs show No. 02, with a small tailplane; all three photographs show different ducts leading the hot air to the rotor. Extensive trials have been undertaken from the truck (part visible in the right-hand picture) which can carry a Djinn, crew and spares, and act as an alighting platform.

AIRCRAFT INTELLIGENCE

Great Britain

Fairey Firefly. In a letter from Australia, a reader who visited Farnborough comments on, among other things, the red-and-yellow Firefly 7 which landed there just after the flying display on one day of the S.B.A.C. Show; he wonders if there was any special significance in these colours. It may be remembered that red and yellow are the colours for pilotless targets (as seen on the M.L. U-120D target), a fact which possibly suggests that there is a new Firefly mark for this purpose.

Hawker Sea Hawk. Although the standard Sea Hawk is the F.1 (not FB.1) it can, in fact, carry a heavy offensive load of bombs and rockets. It is replacing not only the Attacker but also the well-liked Sea Fury, both of which were classed as fighter/bombers. Several years ago the decision was taken to fit jettisonable fuel tanks to the Sea Hawk but, even today, no standard installation is in use. The first conception was a pair of tip tanks, which can readily be fitted to a "plank" wing. But the usual tank now fitted is attached to pylons only just outboard of the main landing gear. The Sea Hawk's range is already good, for the bifurcated jet outlets permit the provision of a tank in the rear fuselage.

Canada

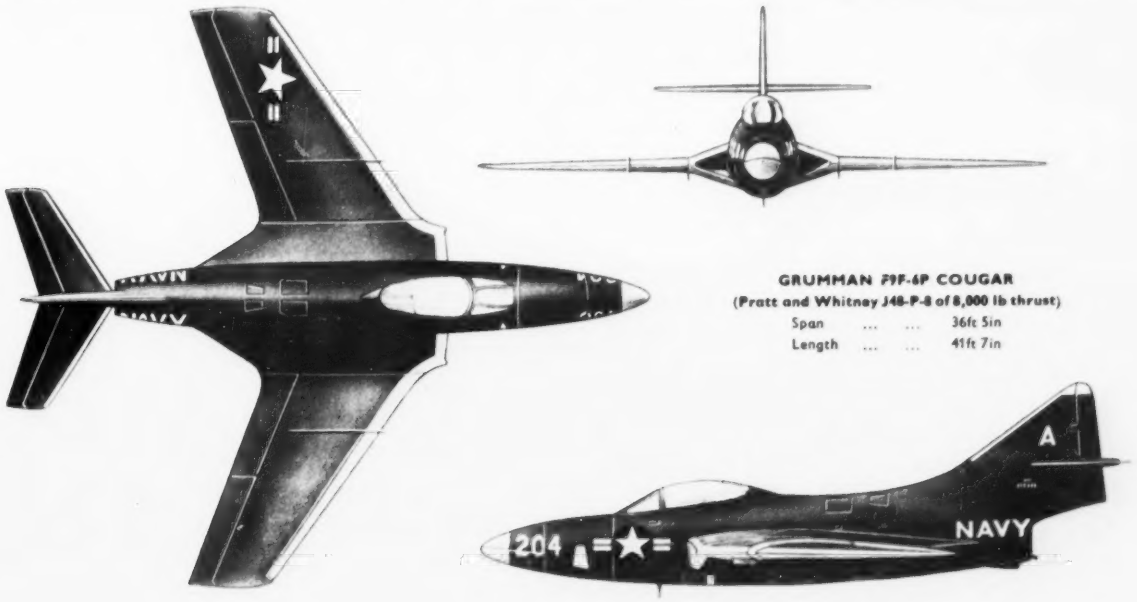
M.R. Britannia. The recent announcement by Bristols regarding licence-production by Canadair of a maritime-reconnaissance Britannia development for the R.C.A.F did not, of course, say anything about the type of aircraft visualized. But a number of points can be raised unofficially. For one thing, it is possible that the Proteus turboprops, efficient as they are, may be replaced by compound piston engines such as the Nomad or Wright Turbo-Compound, in order to provide greater endurance at low level. Very extensive radar will certainly be required and it was stated by Dr. A. E. Russell, the designer of the Britannia, that there might be provision for an external offensive load, such as three torpedoes. Whatever form it takes, it should be a very fine aircraft.

United States

Grumman Cougar. Subject of this week's drawing below, the Cougar is in large-scale service with the U.S. Marine Corps and Navy. The F9F-6 is powered by a development of the Rolls-Royce Tay; the F9F-7 has a late-model Allison J33 and the F9F-8 can have either engine. Both engines give about 8,000 lb thrust with afterburner and water injection. The -P sub-type (below) is unarmed and has a typical three-camera installation in the nose. The F9F-8 is a stripped-down air-superiority version, claimed to be supersonic in level flight. The Cougar is proving a good machine, but is still suffering from tail-actuator trouble.

Lockheed XF-104. In a recent lecture, Mr. Kelly Johnson of Lockheeds stated his reasons for preferring the straight-wing, conventional-tail layout for fast fighters. It should be remembered (although he did not refer to the fact) that Lockheed have almost finished the prototype XF-104 fighter which is just such an aircraft. It is a supersonic lightweight fighter, employing a razor-thin, straight wing, with a slight anhedral angle. Although much bigger and heavier than the British Gnat the XF-104 is lighter than the Sabre and is an attempt at obtaining high performance by cutting down on non-essentials.

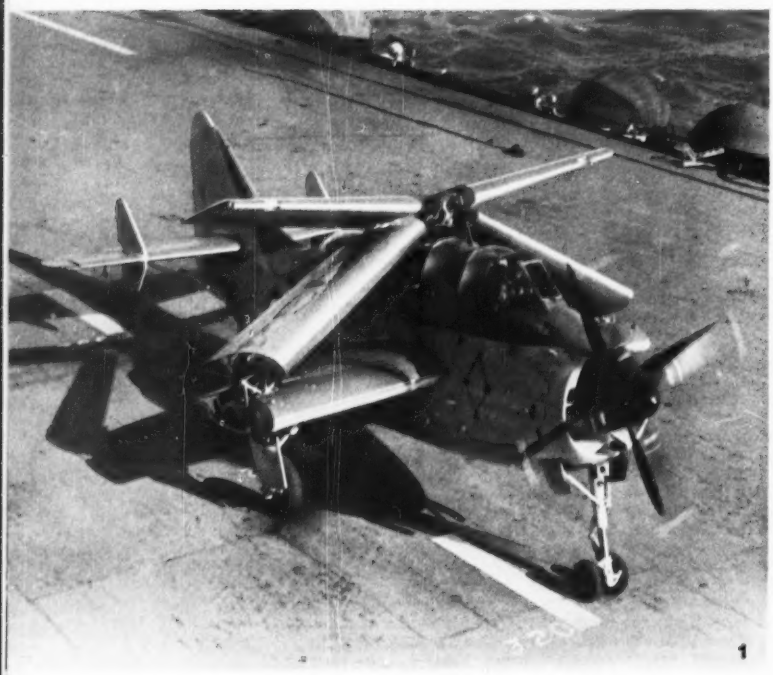
Martin B-61 Matador. Although the *Air Force Daily*, published in London by the U.S.A.F., avers that squadrons of B-61 tactical pilotless bombers will be sent to this country next spring, this is denied by the U.S.A.F. in Washington. The B-61 is an all-swept, subsonic weapon powered by an Allison J33 centrifugal jet, with rocket-assisted take-off from a ramp. The range is about 300 miles. A notable feature is the integral construction of the airframe. Hundreds have been delivered, many being stored disassembled in crates.



GRUMMAN F9F-6P COUGAR
(Pratt and Whitney J48-P-8 of 8,000 lb thrust)

Span	... ...	36ft 5in
Length	... ...	41ft 7in

Admiralty official photographs, Crown copyright.



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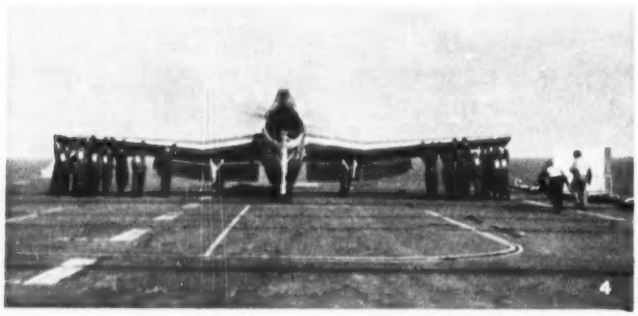
TRIALS FR

AS we reported on November 20th, a significant series of trials took place during October and November aboard the fleet carrier H.M.S. *Eagle*. Each of the aircraft types involved is illustrated here. The first production Fairey Gannet AS 1, at **1** and **4**, carried out a full series of deck trials both by day and by night, and proved itself an eminently usable machine. Similar trials were completed by a D.H. Sea Venom FAW 20, seen at **2**, folding its wings while running forward from the arrester landing area. The work of the Bristol 173 Mk 1, now serialled XF 785, was described last week; at **3** it is evidently proving of interest to the deck crews. Pictures **5** and **6** show the Supermarine 529 twin-Avon fighter, which is solving many of the problems which are anticipated with its all-swept successor. The 529 (it differs but little from the earlier 508) weighs more than any previous naval fighter; nevertheless it was catapulted without difficulty (**5**). The Westland Wyvern S 4 (**7**) was success-



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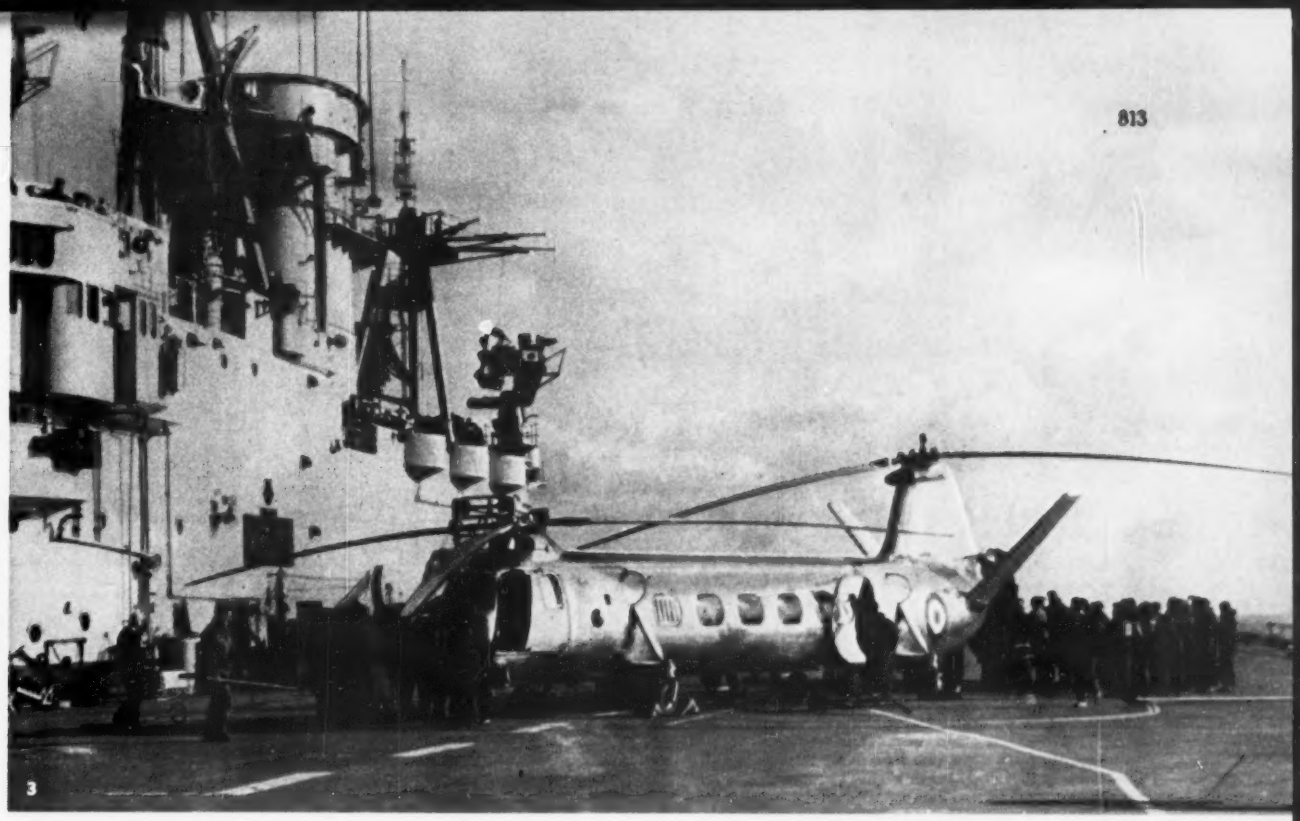
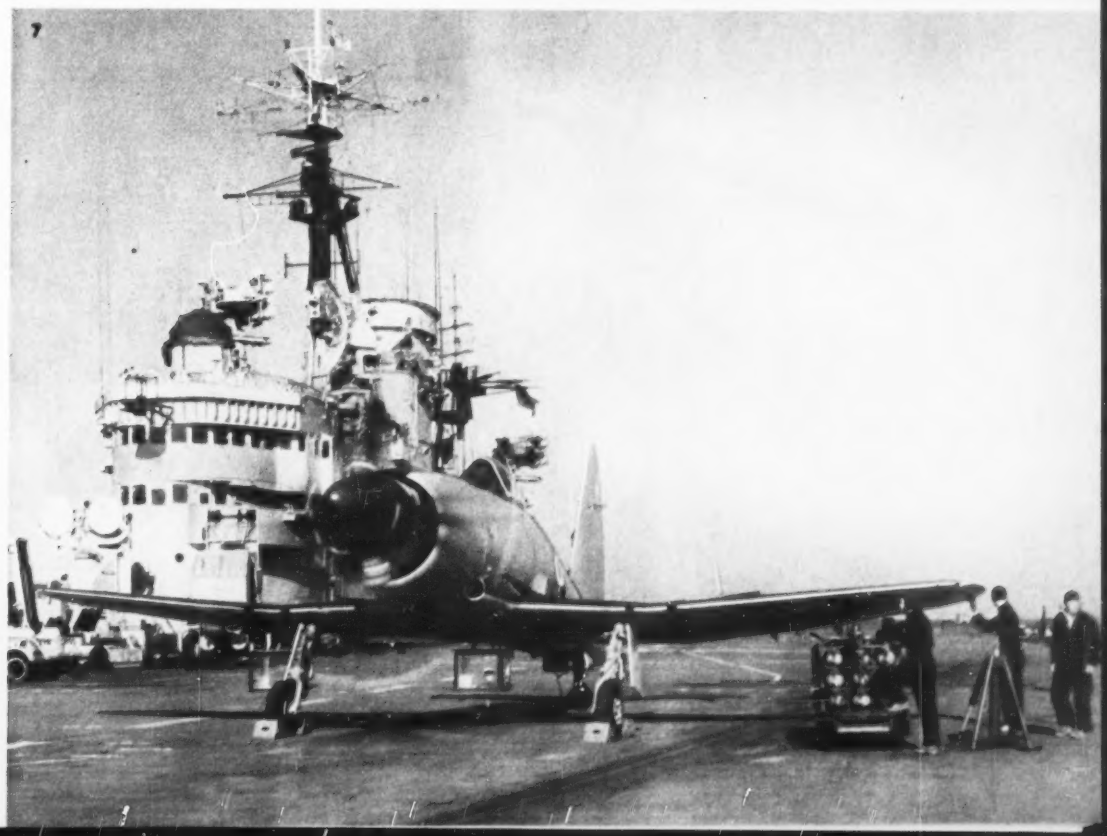


OM EAGLE

fully put through catapulting and deck-landing trials; the big Python turboprop is started by the battery of compressed-air bottles, seen on the right. The final type involved in the trials was the delightful Hawker Sea Hawk F 1 (**8**), at present the Fleet Air Arm's standard first-line single-seat fighter. The machine shown was fitted with under-wing tanks, part of one being visible beneath the starboard flap. Dropping away is the towing bridle (also in **5**), seen being attached to the catapult in **6**.



FOR ESCORT CARRIERS

SECURED on the occasion of *Flight's* visit to the Sherpa demonstration, described last week, these new studies of the Short Seamew light anti-submarine aircraft, now in production for the Royal Navy and NATO forces, form an excellent guide to features of recognition and technical interest. It must, however, be remarked that the production-model Seamew will not, so to speak, have a tin can tied to its tail, as has this prototype, flown by Tom Brooke-Smith (the contents, of course, being an anti-spin parachute). The temporary slots seen on the inboard sections of the tailplane will also be dispensed with, in favour of upswept tailplane roots. Factors contributing to the altogether exceptional field of view are the small dimensions of the Armstrong Siddeley Mamba turboprop (allowing a short, narrow fuselage nose), the high placing of the pilot's cockpit, and the form of the windscreen. The Seamew was specifically designed for operation from escort carriers. Its characteristics at the lower end of the speed range are reminiscent of the Fairey Swordfish.

THE VERSATILE

Pembroke

(2 x Alvis 550 h.p. Leonides engines)

General Purpose Military Aircraft for the modern Air Force.

Communications—rearward facing seats for eight passengers.

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Parachuting supplies through large cabin door opening.

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The Pembroke as a freighter will lift 2,300 lbs for a still air range of 1,000 miles or over 3,100 lbs for 500 miles cruising at 173 m.p.h.

* *Ordered in quantity for the Royal Air Force, the Royal Belgian Air Force, and the Southern Rhodesian Air Force.*

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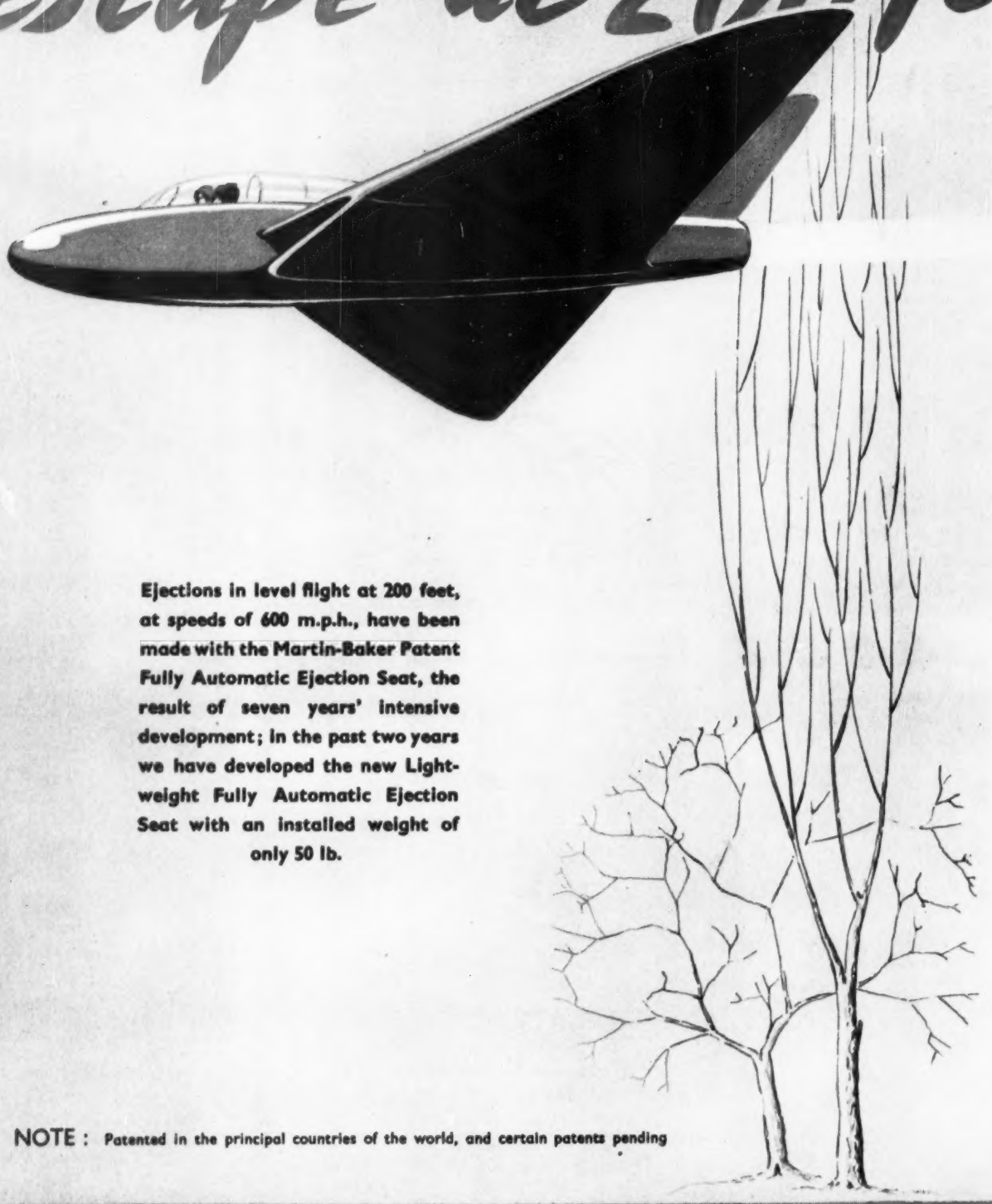
escape at 200 ft.



Ejections in level flight at 200 feet, at speeds of 600 m.p.h., have been made with the Martin-Baker Patent Fully Automatic Ejection Seat, the result of seven years' intensive development; in the past two years we have developed the new Light-weight Fully Automatic Ejection Seat with an installed weight of only 50 lb.

* NOTE : Patented in the principal countries of the world, and certain patents pending

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HELICOPTER GROUND RESONANCE

Undercarriage Design Problems Discussed at Helicopter Association Meeting

THIS season's fourth meeting of the Helicopter Association of Great Britain took place—as we briefly recorded last week—on Friday, December 4th, in the library of the Royal Aeronautical Society. A technical paper entitled *Ground Resonance of the Helicopter*, by R. M. Howarth, M.A., and C. H. Jones, B.Sc.(Eng.), was read by Mr. Howarth and afterwards discussed. We give here a résumé of the proceedings.

The chairman of the meeting, Mr. C. F. Uwins, O.B.E., introduced the joint authors. Mr. Jones, he said, had been a student apprentice at Bristols in 1940, and was now technical assistant in the structural-design department. Mr. Howarth, who would be presenting the paper, had been awarded the mathematical Tripos at Cambridge, and, before joining the Bristol Company, had spent a period with Flight Refuelling, Ltd. He was now assistant chief designer (helicopters) at Bristol.

Mr. Howarth began by defining the term "ground resonance." It was, he said, a divergent oscillation of the helicopter on its undercarriage, in which the rotor hubs moved cyclically in the plane of rotation; it might occur when the helicopter rested on the ground with its rotors turning, or, more probably, when taxying, landing, or taking-off. A coupling existed between the rotor freedom and one or more degrees of freedom of the helicopter. If this coupling allowed energy to be transferred from the stored kinetic energy of rotation to the helicopter oscillation at a greater rate than energy was dissipated at the undercarriage and at the drag-hinge dampers, then self-excited or divergent oscillations would occur. The problem was analogous to the flutter of a wing.

Self-excitation could occur only at rotor speeds near a natural frequency of the helicopter. It was general practice in design to ensure that the lowest natural frequencies of the aircraft, when airborne, should be well above the maximum rotor speed. This confined the phenomenon of self-excitation to modes of vibration of the helicopter on its undercarriage (i.e., on the ground).

Using Coleman's theory as a basis, the lecturer then went on to discuss mathematically the theory of drag-hinge oscillations, showing the effect of damping, and the influence on vibration frequency of coupling between lateral and rolling modes. His conclusions showed that, where an unstable range did exist in which self-excited oscillations were a possibility, it was unlikely that sufficient damping could be provided to eliminate them. Within that range the designer had to rely for stability on a suitable selection of the frequencies of coupled modes.

Three schemes of undercarriage design were considered by the lecturer, representing some of the alternatives a designer could adopt to avoid ground resonance. Scheme 1 was typified by the landing gear of the Bristol 173 Mk 1. Each telescopic leg was partly filled with oil, and connected by a large-bore pipe to the chamber. The two chambers were connected by a small-bore pipe. The piston in the chamber was pre-loaded by air pressure in the space below. Where a simultaneous load was applied to the wheels in a normal landing the system worked as though normal oleos were fitted. In a one-wheel landing oil passed through the cross-pipe and the opposite wheel was moved downwards towards the ground, thereby reducing the time before both wheels shared the load, and reducing the tendency to bounce.

Scheme 2 employed a torsion bar to ensure high mechanical stiffness in roll. As a result, the rolling frequency was well above the maximum rotor frequency. In a one-wheel landing both oleos operated on the one wheel. Such an undercarriage tended to become less stable with increase of taxying speed, but was safe in the event of a burst tyre. Scheme 3 relied on the lateral stiffness of the tyre and the vertical stiffness of the oleo to provide stability. It was in common use, and the Bristol 171 landing gear was a typical example. Although this method had been the most successful for smaller machines, care had to be taken to see that the pressures of the tyre and oleo were correctly matched, and the system was likely to give trouble if a puncture or tyre burst occurred.

Generally, the problem of ground resonance was likely to assume greater importance with the advent of larger helicopters, and the designers' difficulties would be eased by the availability of more comprehensive data on the dynamic properties of shock-absorber struts and tyres.

The Discussion

Mr. Kenneth Reed (Saunders-Roe) thought it was essential that a series of ground tests be made on the actual machine to determine that it was free from any tendencies to resonance. Models were not a satisfactory substitute. If a burst tyre could cause resonance, then pneumatic tyres should be excluded from the design. Why not solid tyres? He, also, thought that the characteristics of hydraulic dampers were superior to those of friction dampers.

Mr. A. E. Fowle (Fairey Aviation) wondered to what extent Coleman's theory could be used for accurate predictions on this question.

Mr. D. J. Mead (Southampton University) made a plea for an electronic simulator to reproduce the effects of ground resonance for research purposes, as with the flutter simulator.

Mr. J. S. Shapiro (consultant) thought that the call for a simulator was misguided. Coleman's theory would give a satisfactory degree of perfection if it was appropriately applied. Too much reliance should not be placed on damping, because of its erratic qualities.

Mr. A. L. Buchan (Saunders-Roe) said that technical research had not produced any resonance-cure other than damping. He suggested that the chassis natural frequency should be kept as low as possible, and the maximum damping be applied to it in order to reduce blade damping which, he thought, should increase in amplitude with movement.

Mr. T. L. Ciastula (Saunders-Roe) felt he had had a full share of trouble in this respect, and that it was necessary to carry out full-scale resonance tests on the ground by introducing excitations into the fuselage with the rotor running.

Dr. G. S. Hislop (Fairey Aviation) suggested that a rotor head without drag hinges was one solution to the problem.

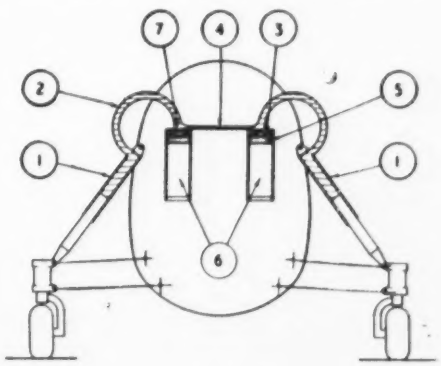
Mr. C. T. D. Hosegood (Bristol) had confidence in Mr. Howarth's theories, as he had found them justified in practice. He said that the 173 would shortly be leaving the Bristol stable, when other pilots would have an opportunity of confirming that it no longer had the slightest tendency to resonance.

Mr. J. Wotton (Percival Aircraft) also considered that the tip-driven rotor without drag hinges should be free from resonance.

Mr. G. H. Tidbury (Saunders-Roe) described the ground-running tests carried out on the Skeeter, and suggested that solid-rimmed wheels with sprung spokes, or some form of tracked undercarriage, might be better than the pneumatic-tyred wheel.

Mr. Howarth, replying to the questions, agreed that certain assumptions had to be made when applying Coleman's theory. But they had worked out in practice, and if one had faith in the theory no ground-running tests should be needed. The time to eliminate ground resonance was in the design stage, before the machine was built. He welcomed the possibility of an electronic simulator. He agreed that damping could be dispensed with by using coupled frequencies, but thought that dampers provided a good safety factor. He concluded by paying a tribute to the work put into the paper by his co-author **Mr. Jones,** without which, he said, it would never have been written.

Torsion-bar system in simple diagrammatic form. Frequencies of coupled modes are separated, so that rolling frequency is well above maximum rotor speed and lateral frequency well below half that speed. Stability within the operating rotor-speed range is thus ensured.



The Bristol 173 Mk 1 undercarriage system: (1) Telescopic leg. (2) Large-bore pipe. (3) Chamber. (4) Small-bore pipe. (5) Piston. (6) Air space. (7) Orifice.

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

Prestwick *v.* Renfrew

I WAS much interested in your report (December 4th) of what has now become the annual slanging match on the respective merits of Prestwick and Renfrew as the centre for aviation in Scotland.

According to those who favour Prestwick, it would appear that they have only one opponent in Scotland, and that all members of the travelling public would welcome a move to Prestwick.

I can assure you that this is not the case. Indeed, many would prefer to see Renfrew developed to the status of an international airport, and Prestwick put on a reserve basis for diversions, etc.

Of course, the reply will be that (1) Renfrew's runways are inadequate for the larger aircraft it would have to accept; (2) the fog question; and (3) the built-up area around Renfrew.

As far as the runways are concerned, they could be improved and a third could be constructed. It is true that a road diversion might be necessary but as this has been done at Prestwick it surely is not impossible at Renfrew.

The question of fog is always one that arises when the case for Prestwick is being pushed. However, it is a fact that they do have fog, and there have been occasions when Renfrew has been open and Prestwick has been clamped down. The record of Renfrew as regards fog is not nearly so bad as we have been led to believe and, with the nation becoming "smog"-conscious, it is likely that the future trend will be for even less than at present.

As for the last question, one need only point to the main airport for Berlin. The fact that it is built-up did not prevent its preference to Gatow as the international terminal for that city.

Finally, no one would wish to add a rail journey of at least one hour to their flying time, merely for the honour of using ". . . the safest and finest and most natural airport on this side of the Atlantic."

Glasgow, W.1. THOMAS KAY BLACK.

Air Whaling

FURTHER to John Grierson's letter in your issue of December 4th concerning the figure of 15,500 blue whales which it was hoped would be taken by the floating factory *Norhval* this coming season in the Antarctic, it would seem that there was a misinterpretation in the original quotation of this number.

The total catch for the 1953-54 season, for all expeditions, is limited by the international whaling commission to 15,500 blue-whale units, a unit being equivalent to one blue whale, two fin whales, or three sei or humpback whales.

This limitation, which is rigidly enforced, has the same aim in view as the restriction on the killing of undersized and lactating whales mentioned by Mr. Grierson, namely, the preservation of balean whale stocks in the Antarctic.

Camberley, Surrey. ALAN GREEN.

Pilots—Service and Civil

IF I may be allowed to refer to the correspondence and articles published in your Journal some weeks ago on the subject of careers for civil pilots, I would like to join John Bishop in deploring attempts to belittle the ability of Royal Air Force pilots to fly civil aircraft. My argument, however, is based on rather different grounds from his.

Wars are not won only by heroes. They are won by ordinary men who in their normal lives would never be expected to show any high degree of courage, but who, under the right leadership, produce this quality when required from the latent source within them. That the Royal Air Force was able to contribute so vitally to the winning of World War II was due to many years devoted to cultivating just this kind of leadership.

Courage has many facets, the most important of which is self-control in the face of danger. In spite of the ceaseless efforts to make civil flying 100 per cent safe, dangerous situations can and do arise; and unless the pilot is able to exert the necessary self-control in such circumstances he may do the wrong thing and cause disaster. It is not, after all, a pilot's instinct for self-preservation which counts, but his aptitude for it; and however high his technical qualifications, if he cannot keep his head when confronted with danger, he and those who fly with him are unlikely to survive.

It will not be enough to guarantee a civil pilot a satisfactory career, though this, by giving him freedom from domestic anxiety, will help enormously in making him efficient at his job. He must be provided with inspiring leadership by men who know how to draw from him such courage as may be needed to cope both with sudden crises and the more persistent conditions of potential danger.

I feel, therefore, that it is wrong in principle to deprive civil aviation of a leavening of pilots versed in the quality of leadership for which the Royal Air Force is renowned, and without which no flying undertaking, civil or military, can hope to succeed.

Purley, Surrey. C. B. GAVIN-ROBINSON.

Instruments and Vibration

WE have read with interest the article on instrument design in your issue of November 27th, but feel that your contributor's remarks regarding the jet-engine era resulting in favourable effects on instrument life give considerably less than the whole story.

It is not only the vibration transmitted from the engines which the instruments have to withstand, and while it is true that in jet-engined aircraft the severity of the vibration at moderate cruising speeds in still air may well be less, under severe operational conditions it has been found to be considerably worse.

This point is particularly referred to in both the R.A.E. publication Technical Memo No. Des. 1, and the corresponding British Standard Specification No. G.100.

We do fully endorse the statement in your own introduction to the article that America's instrument industry has been responsible for some notable developments and would suggest that not the least of these has been in connection with improved anti-vibration mounts to protect instruments under these more severe conditions.

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[The relevant section of B.S.S. G.100, referred to by our correspondent, contains the following passage: "With the introduction of jet-turbine and jet-turbine-propeller power units early subjective opinions led to the belief that some relaxation of vibration test requirements would be possible, particularly at the lower end of the frequency range. Subsequent vibration measurements, however, have shown that, although there may be considerable reduction in vibration level at moderate cruising speeds in still air, this is not the case during the more severe operational conditions (e.g., high speed flight and manœuvres). In the more severe conditions, the amplitudes have reached, and in a few cases exceeded, the levels now quoted. Such high amplitudes have not been confined to any particular part of the frequency range and no relaxation of the test amplitude/frequency curves has therefore been made for jet-powered aircraft from the evidence at present available"—Ed.]

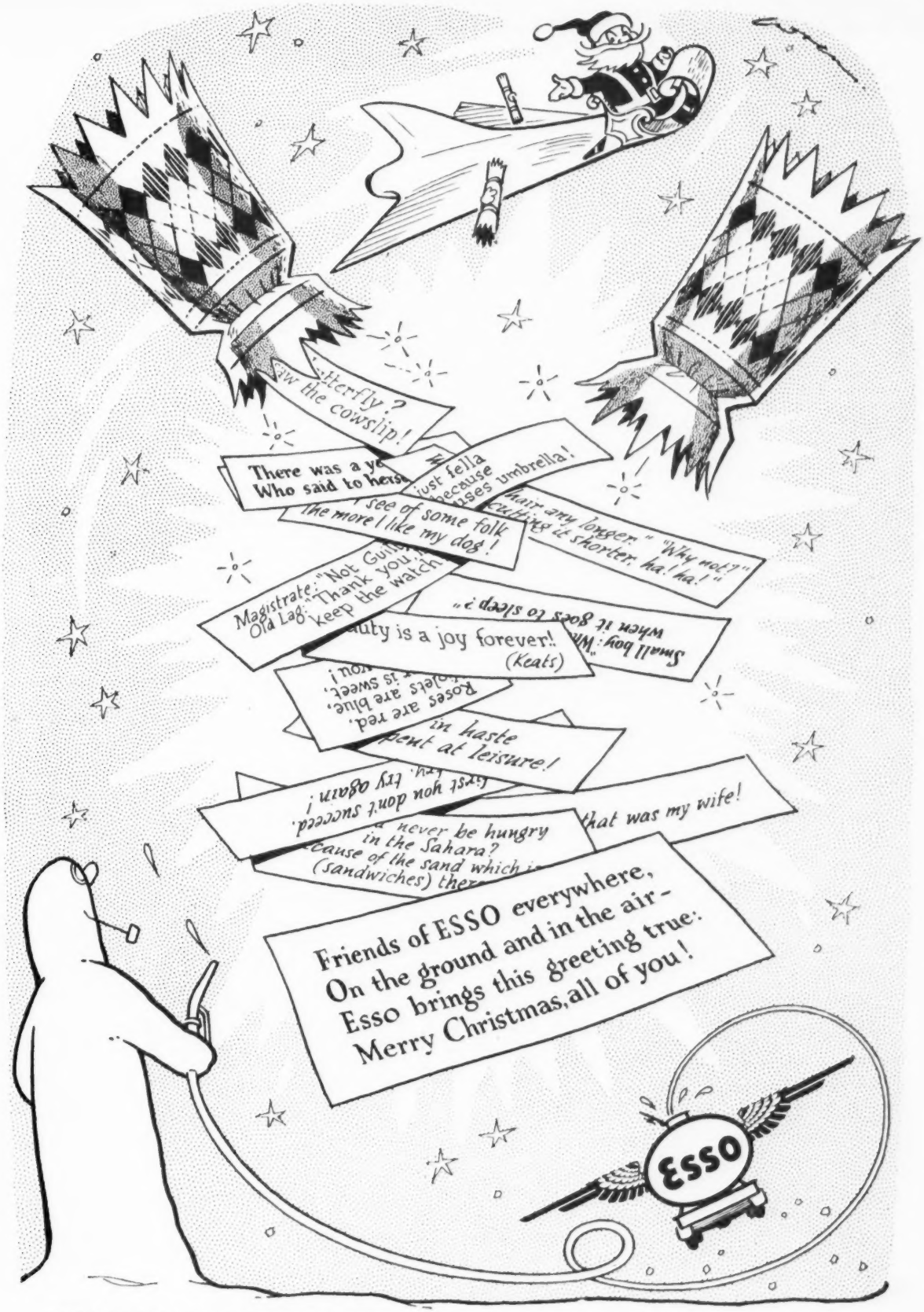
FORTHCOMING EVENTS

Dec. 18-19. Institution of Production Engineers: Conference: "Problems of Aircraft Production" (at Southampton University).
Jan. 2. British Interplanetary Society: "Cosmic Radiation Hazards in Space Flight," by Dr. L. R. Shepherd, Ph.D.
Jan. 6. Institute of Metals: Informal discussion, "Lubricants for Non-ferrous Metal Working."
Jan. 7. R.Ae.S. Main Lecture: "The Fun of Finding Out in Flying," by Sir Leonard Bairstow, C.B.E., F.R.S., Hon.F.R.Ae.S.
Jan. 9. British Interplanetary Society (North-west Branch): "Our First Goal—the Moon," by P. A. Moore, F.R.A.S.
Jan. 15. Institute of Navigation: "Methods of Air and Surface Navigation," by W/C. E. W. Anderson, D. H. Sadler, Lt. Cdr. R. B. Michell, R.N., and G/C. E. Fennessy.
Jan. 16. British Interplanetary Society (Midlands Branch): Brains Trust.
Jan. 16. British Interplanetary Society (Provisional Yorkshire Branch): Short paper evening and Brains Trust.
Jan. 18. Photogrammetric Society: "New Stereoscopic Plotting Instrument for Aerial Photographs," by Professor E. H. Thompson.
Jan. 21. R.Ae.S. Main Lecture: First Mitchell Memorial Lecture, by J. Smith, C.B.E., F.R.Ae.S. (at Southampton).
Jan. 22. Helicopter Association: Brains Trust.
Jan. 23. Aircraft Recognition Society: Seventh All-England Recognition Contest.
Jan. 23. British Interplanetary Society (Provisional Western Branch): "Development of Astronautics in the Next 25 Years," by E. Burgess, F.R.A.S.

R.Ae.S. Branch Fixtures (to Jan. 11).—Dec. 18, *Birmingham*, films. Dec. 21, *Brough*, Wright Jubilee Dinner and film.

Jan. 4, *Bristol*, "Review of Developments in Aircraft Equipment," by G. H. Dowty. Jan. 6, *Belfast*, joint meeting with Queen's University Film Society; *Luton*, Wilbur Wright Centenary film; *Brough*, "New Developments in Aircraft Production Engineering," by Professor J. V. Connolly; *Chester*, "Guided Weapons," by D. J. Lyons.

Jan. 11, *Birmingham*, joint meeting with Institute of Rubber.



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THE CHRISTMAS BOOKSHELF

DEAR AUNT MATILDA.—Your suggestion of giving people aviation books for Christmas this year, to mark the Golden Jubilee of Powered Flight, is certainly a good one—though I must admit I hoped you had forgotten about the time when I accidentally left my copy of Bernt Balchen's biography *Hitch Your Wagon* by your bedside. We *loved* having you stay with us for those six months—honestly!

Anyway—to business.

First of all, there's Uncle. Obviously, you want something special for him, and I can suggest nothing better than Charles Gibbs-Smith's new *History of Flying*. The author is keeper at the Victoria and Albert Museum, and keeper-in-charge of the Wellington Museum at Apsley House; and there's very little he does not know about the early history of flying. With the careful attention to detail that one associates with his profession, he presents a cavalcade of facts, figures, fantasies, hopes and achievements that represent man's attempts to fly over a period of 4,000 years.

It is a fascinating story, told with enthusiasm and illustrated with 162 photographs and drawings of almost everything from bird-men (and women) to the Comet. There is little doubt it will please Uncle, because, like him, Mr. Gibbs-Smith obviously believes things are not what they were in his young days: there are 20 pages on the "naughty nineties," and only 12 on the last 35 years!

So that Uncle does not have things all his own way, however, I think you should try to get a copy of the U.S. Aircraft Industries Association's *Aircraft Yearbook* for Cousin Tom. This year's edition is a special Jubilee one, and is quite unique as a compact reference volume on one country's contribution to aviation progress. It contains a superb 500-item chronology of U.S. aviation, and a masterly 12-page essay which puts the Wright Brothers' achievements in their proper perspective; then it launches off on to some 450 pages of solid facts and figures dealing with every aspect of present-day American aviation activities.

There is, for example, a list of aviation books published in America during the year, and another list of world records current when the book went to press. One section gives completely new data on technical developments of U.S. industry; full specifications of every U.S. aircraft and engine in production, with photographs and line drawings; comprehensive notes on the current activities and finance of every major company in the U.S. aircraft industry; and tables of data giving everything from the number of aircraft produced annually in America since 1913 to the miles flown daily by every type of U.S. air liner over the last ten years.

That should keep Tom quiet for weeks. Now for Dad. Although it has only an indirect connection with aviation, I know he would enjoy *The Eddie Chapman Story*. You probably read extracts from it in one of the Sunday newspapers—all about a young Englishman who was parachuted into this country twice during the war by the German espionage system, to spy on our airfields and blow up de Havillands. Quite apart from the fact that his first landing was at Littleport, where we used to live, this true story, told by Frank Owen, is far more exciting (and what the cinemas call "gripping") than any spy-story in fiction.

Your fear of being unable to find something suitable for dear old Uncle Gus was groundless. He never stops telling us what he thinks of France (although there is more to Paris than the Eiffel Towel and *Moulin Rouge*). So I have chosen for him *The Flying Sailor*, by Rear-Admiral André Jubelin, so that he can read what a Frenchman thinks of us. A description of the Sunday habits of English gentlefolk is a masterpiece; but only one of many.

Jubelin began by escaping from Saigon in a tired Pelican lightplane, which his fellow-escapers had to flight refuel over the shark-infested sea, *en route* to Malaya. On arrival in England, he first brought a retired battleship to the aid of Portsmouth's anti-aircraft defences and then fiddled his way into the cockpit of a Spitfire. But perhaps the most interesting section of the book describes his tour of duty with MacLachlan's famous No. 1 Squadron of Hurricane night intruder fighters. *Vive l'entente cordiale!*

Now for the terrible twins. *The Demolished Man*—Sidgwick and Jackson's latest science-fiction thriller—is just the job for Ernie. It is set in the year 2301, when old salts will offer joyrides at "fourpence round the milky way." Normal speech has given way to telepathy, so that the secretaries know what the boss is thinking, and there is enough horror, crime and super-science to give Ernie nightmares until *next* Christmas.

Algernon deserves kindlier treatment, so buy him Jim Stevens' new book *The Shape of the Aeroplane*. It will tell him not merely *how* aircraft have progressed from contraptions of stick-and-string to sleek masterpieces in metal, but *why*. It is history combined with sound lessons in easy-to-understand practical aerodynamics, illustrated with scores of the author's drawings and diagrams. It looks a little stodgy, but it is not; and, with a few exceptions like the Typhoon-Tempest evolution story, it sets a high standard of accuracy.

Judging from the length of time Ken kept my copy of *Stuka Pilot*, he enjoys reading of the experiences of the people who used to try to shoot him down (and up) ten years ago. So *I Flew for the Führer* and *Heaven Next Stop* should be right up his street. The authors of both these autobiographies were German West Front fighter pilots of more than average skill, one flying Me109s and the other Fw190s. Both emphasize that they had no real hatred for Allied pilots and give examples of their kindly treatment of shot-down enemies.

They paint a sorry picture of the steady deterioration of the *Luftwaffe* into an inadequately equipped, outnumbered force, flung into battle to satisfy a Führer's intuition. How far its defeat dictated the kindliness in the books one can only surmise; but Ken will be interested to read of Heinz Knoke's "57 varieties" of training aircraft; of the "bugs" that beset pilots of Me109s, Fw190s and the first Me262s; and of the terrific respect *Luftwaffe* pilots had for his Spitfire even in 1944-45. There are interesting stories in both books of the use of rockets and *bombs* against bomber formations, and accounts of actions like the *Scharnhorst-Gneisenau* Channel dash and the German "last fling" air attack of New Year's Day, 1945, as seen through German eyes.

It is, as you anticipated, rather more difficult to suggest a book for Uncle Willie. He certainly could not be bothered with history, and would never approve of the technicolored language and combat descriptions in the war books. Flying saucers are more his cup of tea, so I should buy him *Flying Saucers Have Landed*, by Desmond Leslie and George Adamski. Even if he doesn't believe Adamski's account of a conversation with a gentleman from Venus, or doubts the authenticity of Adamski's remarkable photographs of flying saucers, he will find plenty to interest him in the first half of the book, which gives in great detail references to flying saucers and like objects in legend and recorded history over thousands of years.

Nobody could read this section of the book without deriving some food for serious thought, especially at references to "aircraft" and weapons of war used by ancient civilizations. The parallel between some of the weapons and our modern atomic bombs seems too similar to be either coincidental or reassuring.

Well—that's the lot! I hope that my suggestions will be of some help with the Christmas shopping. All that remains is for me to wish you a *very* happy Christmas.

P.S.—I forgot to tell you who publishes these books, and what they cost. Here are the details:

A History of Flying, by C. H. Gibbs-Smith. B. T. Batsford, Ltd., 4 Fitzhardinge Street, London, W.1. Illustrated. 21s.

Aircraft Yearbook. Official publication of the U.S. Aircraft Industries Association. Lincoln Press Inc., 511 11th Street, Washington 4, D.C., U.S.A. Illustrated. $6.00.

The Eddie Chapman Story, by Frank Owen. Allan Wingate, Ltd., 12 Beauchamp Place, London, S.W.3. 10s 6d.

The Flying Sailor, by Rear-Admiral André Jubelin. Hurst and Blackett, Ltd., Hutchinson House, Stratford Place, London, W.1. Illustrated. 16s.

The Demolished Man, by Alfred Bester. Sidgwick and Jackson, Ltd., 44 Museum Street, London, W.C.1. 9s 6d.

The Shape of the Aeroplane, by James Hay Stevens. Hutchinson and Co., Ltd., Hutchinson House, Stratford Place, London, W.1. Illustrated. 12s 6d.

I Flew for the Führer, by Heinz Knoke. Evans Bros., Ltd., Montague House, Russell Square, London, W.C.1. Illustrated. 12s 6d.

Heaven Next Stop, by Gunther Bloemertz. William Kimber and Co., Ltd., 46 Wilton Place, London, S.W.1. Illustrated. 12s 6d.

Flying Saucers Have Landed, by Desmond Leslie and George Adamski. T. Werner Laurie, Ltd., 1 Doughty Street, London, W.C.1. Illustrated. 12s 6d.

Other Books Received

Wings Across the Tasman, by Leslie Jillett. A. H. and A. W. Reed (U.K. Agents: Phoenix House, Ltd., 38 William IV Street, London, W.C.2). Price 16s.

The Winged Life—A portrait of Antoine de Saint Exupéry, Poet and Airman, by R. Rumbold and Lady Margaret Stewart. George Weidenfeld and Nicolson, Ltd., 7 Cork Street, London, W.1. Price 16s.

Jet—The Story of a Pioneer, by Sir Frank Whittle. Frederick Muller, Ltd., Earls Court Gardens, London, S.W.5. Price 16s.

The Aircraft Engineer's Handbook: No. 1—Airframe Structure and Controls, Flying Instruments and Equipment, by W. J. C. Speller. Sir Isaac Pitman and Sons, Ltd., Pitman House, Parker Street, London, W.C.2. Price 30s.

Airborne at Kitty Hawk, by Michael Harrison. The British Publishers Guild, Ltd., 182 High Holborn, London, W.C.1. Price 2s (paper-backed).

Heat-Resisting Steels and Alloys, by C. G. Conway. George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Price 25s.

Royal Air Force 1939-1945. Vol. I—The Fight at Odds. By D. Richards and H. St. George Saunders. (First volume of the interim history of the R.A.F. in World War II, beginning with the expansion of strength initiated in 1934 and carrying the story through the Battle of Britain.) H.M.S.O., Atlantic House, Holborn Viaduct, London, E.C.1. Price 13s 6d. (A notice appears on p. 826 of this issue.)

Flight into Space, by J. N. Leonard. (An informative series of essays, in non-technical style, on various aspects of rocket flight and space exploration.) Sidgwick and Jackson, Ltd., 44 Museum Street, London, W.C.1. Price 12s 6d.

For Yachtsmen

Now on sale is *Yachting World Annual 1954*, a publication of value and interest to yachtsmen everywhere. Among the special articles are an important contribution on design, by J. Laurent Giles, R.D.I., M.I.N.A., and the section on new yachts, which has attracted so much attention in previous years, has been enlarged; details of over 40 boats are given. Other regular features include reports on the more important events of the season; offshore and inshore racing; dinghy racing; and powered-craft events. Throughout, much use is made of outstanding photographs taken during the year.

Yachting World Annual is obtainable from booksellers, price 30s, or by post (31s 2d) from the publishers, *Yachting World*, Dorset House, Stamford Street, London, S.E.1.

AWARD FOR ABILITY

The Story of the F.A.I. Gold Medal from its Inception in 1925

ALTHOUGH the Fédération Aéronautique Internationale was founded as far back as October 14th, 1905, it was not until twenty years later that the award of the F.A.I. Gold Medals was instituted. At the annual meeting that year it was agreed to award one—and one only—gold medal annually to whosoever had, in the opinion of the F.A.I., accomplished the most outstanding performance in aviation during the year.

Until 1946 the award was made only to pilots, for some feat of actual flying; but in that year it went to Igor Sikorsky for his contribution to helicopter development, and thereafter it has often been given as a reward for invention or organization.

The F.A.I. also awards its silver medals to all pilots who break world records in the four major categories—for speed, height, distance in a straight line, and distance in a closed circuit.

The first gold medal was awarded, in 1925, to the Italian, General the Marquis di Pinedo. With his engineer Campinelli, he flew in a Savoia S.15 flying-boat from Rome across India, and thence *via* what was then the Dutch East Indies, to Broome on the north coast of Western Australia. From Broome he then flew along the coast of Australia to Darwin, and on *via* the Philippines to Hong Kong and Tokyo and then back to Rome *via* India. He covered 35,000 miles in 201 days, flying the last 15,000 miles in 22 days. He was hailed as a hero by the people of Italy but he incurred the displeasure of Mussolini by failing to be a fervent fascist. He was killed a year or two after this flight, when his aircraft caught fire and crashed when he was trying to take off from a New York airport with a tremendous overload of fuel for a transatlantic flight.

The gold medal went to a Briton for the first time in 1926, when the recipient was Sir Alan Cobham. This was in recognition of a flight in a D.H. 50 floatplane (385 h.p. Armstrong Siddeley Jaguar) from England to Australia and back, the journey being made to survey the possibilities of opening a regular air route. The total of 28,000 miles was covered in 320 flying hours. Cobham chose a seaplane as in those days there were very few land airports on the route. At Darwin he replaced the floats by a wheel undercarriage for the flight across the Australian outback to Melbourne and the return to Darwin. He had started his journey from the Medway at Rochester, and he finished it by alighting on the Thames alongside the Houses of Parliament, gliding in over Westminster Bridge with very little room to spare above the passing buses. He came ashore at the Terrace, where he was received by the Speaker of the House of Commons. He was made a K.B.E. by King George V in recognition of his achievement.

For 1927 the gold medal went to Colonel Charles Lindbergh for his non-stop solo flight from New York to Paris—3,600 miles in 33½ hr—in his Ryan monoplane *Spirit of St. Louis*, with a 220 h.p. Wright Whirlwind engine, built specially for the flight. He took off with a big overload from Roosevelt Field, New York, after a very strenuous period of work to get the aircraft ready, and his greatest difficulty was to keep awake. During the first half of the flight he was seldom able to climb above 200 feet because of his overload of fuel.

Hinkler's Australia Flight

For 1928 the award was made to that great little Australian, S/L. H. J. L. (Bert) Hinkler, A.F.C., D.S.M., R.A.A.F. Hinkler was a quiet, unassuming chap only a little over five feet tall. After a fine attempt to fly a 35 h.p. Avro Baby from England to Australia in 1920 he became chief test pilot to A. V. Roe and Co. and flew Avros in the early Lympne Light Aeroplane Competitions. He flew to Australia in an Avian with a Cirrus engine designed by Major Frank Halford and built by A.D.C. Aircraft, Ltd., at Croydon. He left Croydon February 7th, 1928, beginning his journey with a non-stop flight to Rome. His last hop was from Bima across the Timor Sea to Darwin. He told me afterwards that he felt very drowsy on the last leg across the Timor Sea in the heat and dropped off to sleep now and then, but was awakened by the stoppage of the engine whenever a tank emptied. I asked him if this was not rather frightening. "Oh no," he said, "not a bit. I just woke up and turned the right taps to bring in a full tank and went to sleep again. And anyway I never saw no ruddy sharks!"

The 1929 medal went to the Frenchman Dieudonné Costes who, with his co-pilot Maurice Bellonte, flew a Bréguet XIX A2 (600 h.p. Hispano Suiza) from Le Bourgêt non-stop across Russia and Siberia to Moulmart on the N.W. frontier of China, 4,743 miles.

The recipient for 1930 was an Italian, General Italo Balbo—famous for his pointed red beard and flashing eyes—who led a formation of eleven Savoia-Marchetti flying-boats from Rome across the South Atlantic to Rio de Janeiro, where the boats were bartered to the Brazilians for a shipment of coffee.

The 1931 gold medal went to Dr. Hugo Eckener, head and chief pilot of the Zeppelin concern, for flights in the *Graf Zeppelin* to the Arctic and over the North Pole, followed by three commercial passenger flights from Frankfurt across the South Atlantic and back.

Señor don Juan de la Cierva, the inventor and chief test pilot of the Autogiro, was honoured in 1932. His work in England helped to make the helicopter a practical proposition.

For 1933 the medal was gained by the one-eyed North American Indian, Wiley Post, for a solo flight round the Northern Hemisphere from New York in 7 days 18 hr 50 min. He began with a flight from New York to Berlin, and onwards across Russia and Siberia by way of Moscow, Novosibirsk, Irkutsk, Rukhlova, Kharbarovski, and thence across the Aleutian Islands to Alaska, where he damaged the airscrew of his Lockheed Vega (P. and W. Wasp) while landing. He changed over to a Vega which brought a replacement airscrew, and in it finished the flight to New York. But for the mishap he would have taken one day less.

The gold medal for 1934 went to C. W. A. Scott for his flight in a Comet (D.H. 88) with Tom Campbell Black from Mildenhall in Suffolk to Melbourne, winning the MacRobertson Race in 71 hr 0 min 18 sec.

No performance in 1935 was deemed worthy of an award, but in 1936 the medal was awarded to the Frenchman Jean Mermoz, who had pioneered and operated the first of a regular airmail service across the South Atlantic. The first flight had been made in a Couzinet monoplane from Paris, and the South Atlantic crossing was made in 16 hr from St. Louis in Senegal to Natal. Later Mermoz extended the airmail route *via* Rio, Buenos Aires and over the Andes where the lowest pass is at almost 18,000ft, to Santiago. The award was posthumous, for Mermoz was lost with a crew of four with a Latécoère flying-boat in the South Atlantic at the end of 1936.

Jean Batten's Feat

In 1937 the gold medal was presented to a woman for the first (and so far the only) time. The recipient was Miss Jean Batten, who had flown a Percival Gull (200 h.p. D.H. Gipsy Six) from Darwin to London in 5 days 18 hr 15 min. The award was made as this was the culminating point of her career following on a record flight from London to Wellington including a crossing of the Tasman Sea, 1,342 miles, and from London to Buenos Aires across the South Atlantic.

There was no award for 1938, because the F.A.I. delegates could not agree whether it should go to the American Howard Hughes for a flight in a Lockheed 14 round the Northern Hemisphere (along the route covered by Wiley Post in 1933) in 3 days 7 hr 17 min, or to S/L. R. Kellett, leader of the R.A.F. Long Distance Flight (Vickers Wellesleys), who broke the distance record by flying from Ismailia in Egypt 7,158.6 miles to Darwin. Instead of a gold medal a commemorative cup was awarded to both pilots.

No further awards were considered until 1946, when a gold medal went to Igor Ivan Sikorsky, a Russian pioneer who went to America when the Bolshevik revolution came in 1918. He had pioneered helicopters—though his early productions would not fly—in 1912. As the result of Cierva's work with the Autogiro, and particularly the free articulation of the rotor blades, Sikorsky produced the first really successful helicopter just before the 1939 war, which has led to the present success of rotary winged flight.

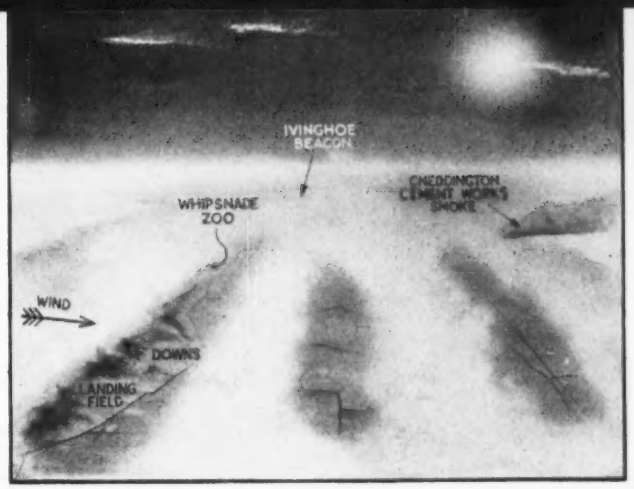
No medal was awarded for 1947, but in 1948 it went to the American test pilot Capt. Charles F. Yeager (Bell XS-1) for being the first man to demonstrate that supersonic flight was possible.

Another year in which there was no award was 1949, but for 1950 the medal went to A.Cdr. Sir Frank Whittle for his work in inventing a practical gas turbine. This award, by an international body on which all free nations are represented, gives recognition to Whittle's claim to be the real inventor of jet propulsion, in spite of the fact—revealed after the war—that a Heinkel He178 powered with a gas turbine flew on August 27th, 1939, whereas the Gloster-Whittle did not fly until May 15th, 1941.

The last award, for 1952, went to the American Edward Warner, for his fine work as president of I.C.A.O., on the organization of civil aviation throughout the world. G. D.

WAVE-SOARING AT DUNSTABLE

Two-seater Pilots Beat the Gulls



An artist's impression of the conditions at Dunstable on December 7th, with the ridge visible through one of the gaps in the stratus.

ON Monday, December 7th, there was a noteworthy series of events at the London Gliding Club, Dunstable, when a Slingsby T.21b two-seater sailplane soared for a total of some two-and-a-half hours in an east-wind wave.

This wave is a "rebound" in the airstream after its forced descent down the slopes of the Dunstable Downs. Although wave-lift has been utilized elsewhere by sailplane pilots since its discovery in Silesia in the early thirties, the Dunstable east-wind wave had only been used on two previous occasions, once by several pilots in 1937 and by Neumark, Lee and Doughty in 1951.

Last week, O. W. Neumark, with Major Conant, was winch-launched to 1,400ft a.m.s.l. in clear air at 11.26 hr and climbed to 2,900ft, where they remained high above the overcast for 47 minutes. Mr. Abbott and Mr. Jones then soared the same sailplane for 15 min. Their places were next taken by Police-officer Doughty and his passenger, who patrolled the "beat" along the ridge at 2,000ft for 45 min. Lastly, Neumark, with Dr. A. E. Slater as co-pilot, soared at 2,100ft for another 45 min and landed at 16.05 hr just before the cloud closed in. All these flights were made in V.F.R. conditions.

While unbroken stratus cloud covered the area with cloud-base and tops at 800 and 1,000-1,200ft a.m.s.l. respectively, a clear-air gap, about 1¼ miles wide, formed downwind and all along the Downs. This localized evaporation of the cloud was caused by its forced descent following the contours of the escarpment and it reformed in the rebounding wave. Altogether, there were four long gaps lying across the wind direction, one behind the other, in the lee of the Downs. Another series of gaps could just be detected behind Ivinghoe Beacon and, had the pilots been flying more efficient sailplanes such as the club's Sky or Olympias, they should have had little difficulty in soaring high above the cloud tops along the Chilterns to Royal Air Force Station Benson.

The surface wind was at first S.E. 15-20 m.p.h. and later dropped to E.N.E. 5-10 m.p.h. It is truly remarkable that the wave continued to produce lift at a strength of 5ft/sec and occasionally 8ft/sec while the surface wind was so weak. The wind at 2,000ft appeared to be even feebler.

During Mr. Doughty's flight a flock of gulls found the wave-lift which he was utilizing. Apparently being novices, and less well versed in the art of soaring than their human rival, they did not follow his wave-soaring technique; instead they circled as in convection or thermal lift, promptly lost the up-current and were forced to resume their flapping flight.

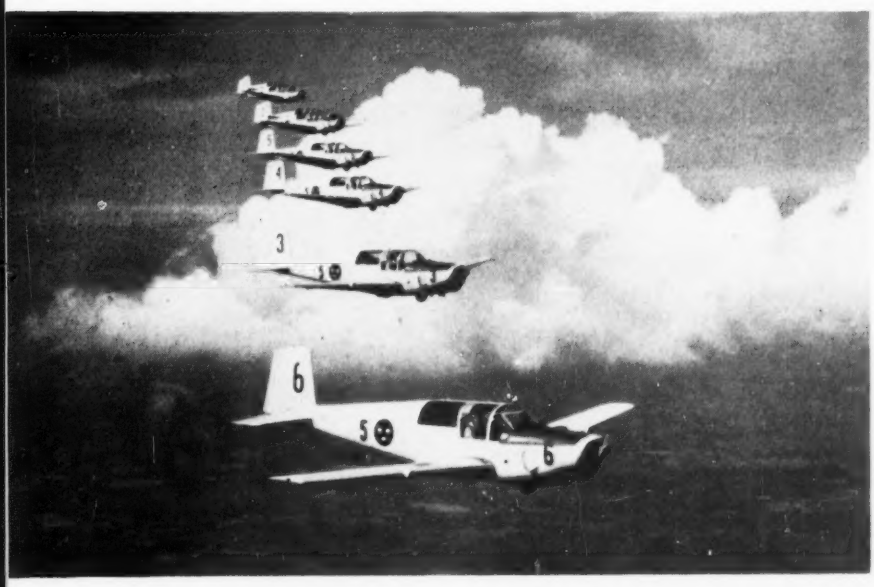
The practicability of utilizing wave-lift downwind of the very low Dunstable Downs has thus been proved conclusively and the club can now offer a new and exhilarating form of winter soaring fully as beautiful and exciting as that provided by the "Schwepperescent" summer thermals. O.W.N.

SAAB SAFIRS

DURING the first week of this month Bertil Andersson, Saab test pilot, brought the first Saab 91C Safir to this country, landing at Blackbushe. The Safir, which is one of the finest light aircraft at present produced in Europe or elsewhere, was here for A.R.B. certification and has now returned to the de Schelde factory in Holland, where the type is being built under licence from the Swedish parent firm whose factory is situated at Linköping.

While the aircraft was at Blackbushe a member of *Flight*'s staff had the opportunity of flying it, and some impressions will appear in our pages in the near future. The 91C is a Lycoming-powered, fully aerobatic four-seater with—we believe—delightful handling qualities. A new photograph appears here of Saab 91B Safir three-seaters, also built in Holland and now used by the Royal Swedish Air Force as basic trainers. Saab themselves are devoting their entire production resources to military aircraft in the form of the J.29 and Lansen; hence the building of the Safir in Holland.

SE-BYZ, the 91C Safir seen at Blackbushe, has a number of "non-standard" fittings, particularly in the cockpit. It had been prepared quickly to meet various commitments, but production versions will have a comprehensive scheme of cockpit furnishing and colouring. Soundproofing is also being incorporated, as the Safir is at present considered by Saab to be a little noisy. Instrumentation and radio are not yet finalized, and will, of course, depend partly on individual customers' requirements. By English standards, however, SE-BYZ is already comfortably and comprehensively equipped. Its airscrew, incidentally, is an almost-square-tipped, plastic-bladed Hartzell.



Safirs stepped up: A fine study of Dutch-built Saab 91B Safir three-seat basic trainers in service with the Royal Swedish Air Force. A four-seat 91C Safir recently visited this country.

THE INDUSTRY

Return to the Industry

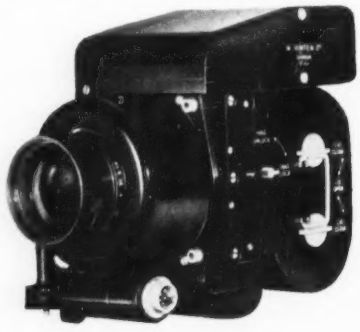
AFTER two years' voluntary service with the Ministry of Supply as Director-General of Electronics Production, Mr. N. C. Robertson, M.B.E., F.R.S.A., A.I.E.E., M.Brit.I.R.E., M.I.P.E., has now resumed his civilian duties as deputy managing director of E. K. Cole, Ltd.

Many senior members of the Ministry of Supply, including Sir James Helmore, K.C.M.G., the Permanent Secretary, attended a private luncheon party held in London recently to bid farewell to Mr. Robertson. Mr. E. K. Cole, chairman of E. K. Cole, Ltd., and other directors of the company were present at the luncheon to welcome back Mr. Robertson to their organization.

First entering the radio industry in 1924, Mr. Robertson joined E. K. Cole in 1930 and was successively chief inspector, production manager and works manager. He was appointed to the Board in 1943 and was made deputy managing director two years later.

A High-speed Low-altitude Camera

ILLUSTRATED below is the Vinten F.95 low-altitude reconnaissance camera, designed for securing high-definition pictures of ground targets from fast-flying aircraft. The instrument uses 70mm negative, which permits considerable magnification without loss of definition through grain size; sufficient film for about 500 exposures is contained in quickly interchangeable cassettes, which can be loaded without removing the camera from its mounting and without the necessity for threading.



The Vinten F.95 camera.

Two Taylor, Taylor and Hobson lenses are fitted, 4in f/2 and 12in f/4, giving angles of view of approximately 18 deg and 6 deg respectively. Both fit the iris-diaphragm remote-control unit which, electrically operated, gives a choice of three apertures on selection by a switch. A continuous-running focal plane shutter gives exposures of 1/1,000th or 1/2,000th sec, for camera speeds of four and eight pictures per second respectively. The camera drive is from the aircraft 24v supply.

A thermostatically-controlled heater is incorporated, and the working range of the camera is stated to be − 20 deg C to + 50 deg C, while a range of − 40 deg C to + 70 deg C will not harm the instrument.

Overall dimensions are 5¼in wide by 9¼in high by 11¼in (with 4in lens) long. Weight, with loaded cassette, is 15 lb 11 oz.

Up to three F.95 cameras can be remotely controlled, either independently or together from a small panel. The panel controls the running of the cameras; carries switches for the heaters; gives a choice of four or eight exposures per second; indicates the amount of film exposed; and has a three-position diaphragm-control of each camera. The makers are W. Vinten, Ltd., North Circular Road, London, N.2.

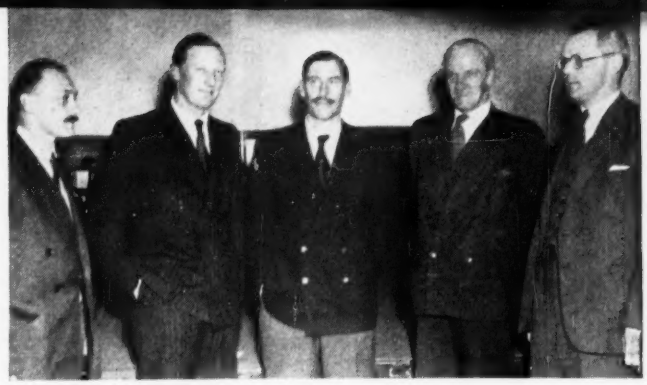
CO_2 Cooled Cutting Tools

THE new "CeDeCut" technique of using carbon dioxide as a machine-tool coolant was demonstrated at the opening of the East Kilbride factory of Rolls-Royce, Ltd., on November 20th, when gas-turbine shafts were shown being machined with and without the use of a liquid CO_2 jet.

The method demonstrated and the apparatus used were developed by the Carbon Dioxide Co., Ltd., in association with the central research department (engineering section) of the Distillers Co., Ltd., who have made patents application.

With the collaboration of the Ministry of Supply, a number of firms (including Rolls-Royce) have carried out production tests with the new technique, and it is stated that most encouraging results have been obtained in a series of difficult cases, particularly in dealing with the modern tough and heat-resistant alloys, including Nimonic and nickel-chrome-molybdenum steels.

Technical information on the process is obtainable from the Carbon Dioxide Co., Ltd., Great Burgh, Epsom, Surrey.



"HIGH-SPEED AEROPLANES" was the title of a talk given by "Mike" Lithgow at a recent meeting of the Leamington and Warwick Engineering Society. In this group are (l. to r.) Mr. D. F. Woor, secretary of the Society; Lt-Cdr. Lithgow; W/C. H. Powell, aircraft liaison, Lockheed Hydraulic Brake Co.; Mr. F. Rowarth, of race-handicapping fame, now general sales manager of Automotive Products Co., Ltd.; and Mr. S. M. Parker, president of the L. and W.E.S.

IN BRIEF

At a recent meeting of the Board of James Booth and Co., Ltd., Dr. Horace W. Clarke was appointed chairman in succession to Sir Bernard D. F. Docker, K.B.E., J.P., who continues as a member of the Board.

* * *

Mr. F. V. Waller, managing director of Western Manufacturing (Reading), Ltd., has recently returned from a business trip to America. As a result of his visits to various companies there, several important new products, manufactured under licence, will shortly be added to the Reading firm's range.

* * *

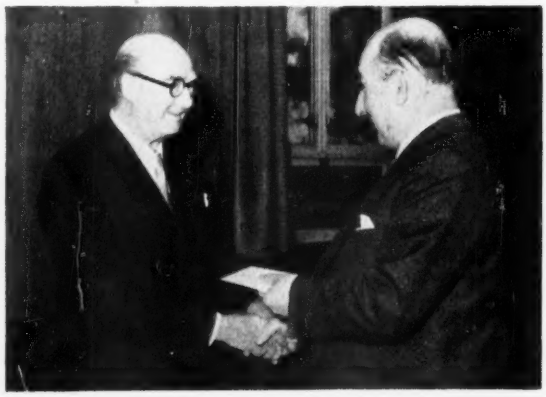
The directors of Plessey Co., Ltd., announce that Mr. J. A. Smith has retired from the Board owing to ill-health. The vacancy has been filled by the election of Mr. J. A. Clark and Mr. M. W. Clark has been co-opted as an additional director. Mr. E. C. Cross has been appointed as joint secretary in addition to Mr. E. H. Ouston, B.Com., A.C.A.

* * *

Sharples Centrifuges, Ltd., of Stroud, state that Mr. M. E. O'Keeffe Trowbridge, B.Sc., A.C.G.I., A.M.I., Chem.E., has recently joined their head office staff. Formerly head of the projects initiation department of Head Wrightson Processes, Ltd., of London, he is well known both here and in the U.S.A. for his work on heat transfer and on solid/liquid separation processes, and is the author of a number of technical papers.

* * *

At the Dorchester, London, on December 4th, Titanine, Ltd., specialists in aircraft finishes—as used on the blue record-breaking Swift—revived their pre-war custom of holding a pre-Christmas cocktail party for their friends in the industry. Some 165 guests were received by Admiral Sir Lionel Preston, K.C.B. (chairman) and Mr. G. W. R. Ward (managing director) with Mrs. Ward. Sir Lionel, incidentally, is the father of Col. R. L. Preston, secretary-general of the R.Ae.C., who was among those present.



MR. ROBERT BLACKBURN presents a cheque to Mr. George Watson (right) experimental manager, who joined the Blackburn Company in 1911. Sixteen 21 years' service awards were recently made to employees, bringing the total up to 274; Mr. Watson is the first "twice 21."

The Short Seamew Light Anti-Submarine Aircraft in quantity production for the Royal Navy.
Specifically designed for operation with the Escort Carriers of N.A.T.O. Forces and for inshore maritime reconnaissance from small coastal airfields.
Particular attention has been paid to the achievement of an extremely light though rugged construction, to ease of maintenance and to the servicing of ancillary components.

Shorts

Short Brothers & Harland Ltd., the First Manufacturers of Aircraft in the World. Queen's Island, Belfast, and 17 Grosvenor St., London, W.1

Fleet Air Arm "Sea Hawks"

OFF *to a perfect start . . .*

with

Plessey **TSC 50**

TURBINE STARTERS

Photograph above shows a simultaneous pilot-operated start by five "Sea Hawks". The smoke plumes are the exhausts of the Plessey TSC 50 Cartridge Starters.

Every British Aircraft relies on **Plessey**

THE PLESSEY COMPANY LIMITED · ILFORD · ESSEX

A33

AUTO-STABILIZED MYSTÈRES

French Firm Approves a British-made Remedy for "Dutch Roll"

Col. Rozanoff, Dassault chief test pilot, with the Mystère IV prototype on which the auto-stabilizer was fitted. On the left is Mr. D. T. Broadbent, Elliott Brothers' chief engineer; on the right, W/C. E. G. Monk, their technical sales manager. Painted on the Mystère's nose is a sonic-bang record; of 125 Mach 1-plus flights, Rozanoff has made 106.

NEWS from France suggests that the Marcel Dassault Mystère IV is continuing to fulfil, if not to surpass, its constructors' high hopes. Following seven prototypes—the original Mystère flew in February 1949—an initial production-batch of 30 is now well advanced on the line at the Bordeaux factory. The power unit is the Hispano-Suiza Tay, with the Avon RA.14 visualized for later marks.

Simultaneously with this news comes an announcement linking the Mystère IV with a well-known name in the British industry.

Quite recently—in June last—the firm of Elliott Brothers (London), Ltd., was invited by Avions Marcel Dassault to co-operate in the elimination of "Dutch roll" from the Mystère IV; the French firm were aware that the British company had been developing, in conjunction with the R.A.E., an automatic stabilizer for high-speed aircraft (this work was briefly referred to in *Flight* of April 10th). Technical consultations followed.

Dutch roll, a "snaking" tendency characteristic to a greater or lesser extent of all swept-wing aircraft, is a phenomenon which makes accurate gunnery and bomb-aiming difficult and which can be uncomfortable and distracting for the pilot.

In common with other comparable aircraft, the Mystère IV has irreversible powered controls, and the designer was faced with the problem of inserting in the rudder control an extensible linkage which would not only operate the rudder hydraulic servo-motor, but which would also meet the required emergency load-factor in the event of the servo-motor becoming unservicable. It was proposed by Elliott Brothers that the link should be sufficiently "phase-advanced" to compensate for any lags in the servo-system and should in addition serve as a roll-damper responsive to signals received from a gyroscope.

M. Jean Rouault, chief engineer of Marcel Dassault, took charge of the installation of the equipment, which consisted of a modified version of the Elliott Mk 1 auto-stabilizer, as developed in conjunction with the R.A.E. It was found necessary to modify the rudder linkage to accept the stabilizer, which was not originally designed for powered-control aircraft. Changes also had to be made in the stabilizer control box.

Nevertheless, the first installation was completed before the end of October, and flight tests were made at Mélun-Villaroche. It soon became obvious, however, that the existing electrically operated jack would require extensive modification to accommodate the servo loads, which were found to increase greatly with rudder accelerations.

An entirely new jack was accordingly developed by Elliott Brothers in conjunction with Rotax, Ltd., and the Mystère's rudder linkage was modified to accept it. This new work was concluded early this month, and a series of test flights was made by Dassault test-pilot Col. K. W. Rozanoff (the almost legendary character whose feats are said to include rolling an R.A.F. Lancaster during the war). This time the outcome was reported as altogether satisfactory: instability in roll and pitch had been completely cured and Dutch roll eliminated. Elliott Brothers state that the Mystère IV thus becomes the first European powered-control aircraft to have its control-system automatically stabilized.

TO AMERICA—VIA THE MOON

DURING the presentation of a paper entitled *The Exploration of Space* before the Radar Association on December 7th last, Mr. A. C. Clarke, chairman of the British Interplanetary Society, announced that he would be leaving this country early in the New Year to live in the United States. He said he felt that, although space-flight was a certainty, it was not very probable before the turn of the century, and he himself "might be rather elderly to take any active part."

Mr. Clarke's paper, which was copiously illustrated with slides, dealt with many of the more important problems associated with space-flight, including escape velocity, refuelling, the construction of space-stations, and the building of living-centres in the somewhat hostile surroundings expected on the moon and Mars. The lecturer made reference to the use of radar and radio techniques which might prove useful, and mentioned the improvement which would be found in astronomical observation once the earth's atmosphere had been pierced.

At the conclusion of his lecture Mr. Clarke received many good wishes for a successful future in his new fields of activity.

CANADIAN AERONAUTICAL INSTITUTE

PLANS have been made in Canada for the formation of a Canadian Aeronautical Institute, to combine and co-ordinate the activities of a variety of organizations. Hitherto there have been four more or less independent bodies catering for the technical interests of those engaged in aeronautics, namely, the Institute of Aircraft Technicians in Montreal, the Ottawa Aeronautical Society and the Toronto and Montreal sections of the Institute of the Aeronautical Sciences, which has its H.Q. in New York. Since the war, also, a considerable number of members of the Royal Aeronautical Society have gone to Canada, but, unlike certain other parts of the British Commonwealth, Canada has no R.Ae.S. branch.

It is hoped to found the Institute, and probably with headquarters in Ottawa, early next year. Potential membership is at present about 800, and it is hoped that others not at present connected with existing societies will join later. The C.A.I. will have as its main object the "promotion of the art, science and engineering of aeronautics," and will form a counterpart to the already existing Air Industries and Transport Association, which serves the needs of management. The secretary of the organizing committee is Mr. H. C. Luttman, 22 Kingsgrove Boulevard, Toronto 18.

AERIAL ARCHÆOLOGY

THE important part now played by aerial photography in archæological study was emphasized in a paper read before the Royal Institution of Chartered Surveyors on December 7th. The lecturer, Mr. C. W. Phillips, archæology officer, Ordnance Survey, told his audience that it had been found uneconomical for surveyors to go into the field until they had examined all the relevant air cover. Without this, more than three-quarters of the content of an area might remain undiscovered. Air photographs assisted in the finding of ancient burial sites, early field systems, new stretches of Roman roads, lost Roman villas, linear earthworks covered by the plough, and mediæval sites—from castles and monastic buildings to deserted villages.

CIVIL AVIATION

CHOSEN BY AIR FRANCE as a Dakota-replacement, the thin-winged Hurel-Dubois HD 32 will have two 1,200 h.p. Twin Wasps and capacity for up to 42 passengers. An order for 24 has been announced in France. Shown here is its predecessor, the HD 31 prototype, which has two 800 h.p. Wrights. An exclusive account of its flying qualities appeared in "Flight" of August 7th.

CONFERENCE ON WEATHER SHIPS

AMERICA'S decision to withdraw from the North Atlantic ocean weather station service will be discussed by representatives of all participating states at a conference to be held early next year at the I.C.A.O. regional office in Paris. The existing agreement, under which 25 ships operate 10 stations in the North Atlantic, is due to expire on June 30th, 1954. The service is financially supported by 15 nations. Last October the United States Government announced that the benefits derived by America were no longer commensurate with the cost of maintaining 14 of the 25 ships, which would therefore be withdrawn when the present agreement expired. Several other nations have subsequently stated their belief that the service should continue. In Paris their representatives will have to decide whether it will be possible to maintain a worthwhile service in the absence of American support.

PAKISTAN PILOT-RECRUITMENT

BRITISH and Australian airline pilots are reported to have received offers of employment with Pakistan International Airlines, who are to begin operations next April with Super Constellations. A Canberra report says that a Pakistan representative also intends to engage two Australian hostesses. Salaries quoted are £4,000 for senior captains and £2,400 for first officers, with contracts running for five or ten years.

B.O.A.C. AND BERMUDA

A STATEMENT on the future of B.O.A.C. services to and from Bermuda was made on December 6th by Sir Miles Thomas, the Corporation's chairman. He was speaking at London Airport on his return from a visit to the Colony. Sir Miles said: "I had useful talks with the Bermudan authorities, who want more B.O.A.C. services. A long-term plan has been worked out so that Bermuda can benefit from the spread of British jet services, using the Comet and the Britannia. It will take some time to get these aircraft on the Bermuda routes, and meanwhile we are increasing our frequencies with piston-engined aircraft."

His visit followed the recent attempt by the Bermuda Government to force the Corporation to increase the frequency of its first-class services from Bermuda to New York. Shortly after B.O.A.C. opened a new Constellation tourist service from London to Barbados and Trinidad *via* Bermuda the Bermuda Government withheld local traffic rights from these weekly flights; aircraft were not allowed to pick up or set down passengers until mid-November, when full rights were restored.

G.A.P.A.N. AWARDS: NOMINATIONS INVITED

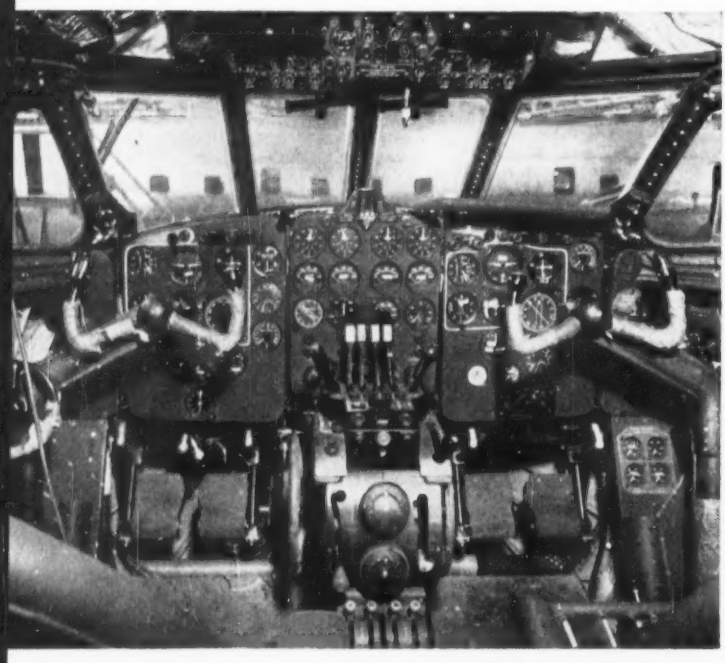
"RESPONSIBLE persons or bodies" are invited by the Guild of Air Pilots and Air Navigators of the British Empire to nominate candidates for the annual trophies and model awarded by the Guild. Details of nominations for the year ended December 31st, 1953, should reach the G.A.P.A.N. at 19, Park Lane, London, W.1, not later than February 10th next year.

The Johnston Memorial Trophy is to be awarded for the most outstanding feat or performance in aerial navigation for flights involving the development of the technology of navigation by a person, or persons, engaged in a civilian or Service capacity. Navigation of a routine or spectacular character is not the essence of the award.

The Cumberbatch Trophy: air safety is the main basis of this award. It will be presented to organizations, or groups within organizations, whose actions over a period have contributed towards complete freedom from accidents of any description coupled with regularity of operation, or it may be awarded to any person or group of persons or bodies corporate who, in the opinion of the Guild, have contributed towards air safety under the terms stated above, or any other terms that the Court of the Guild may decide.

The Brackley Memorial Trophy will be awarded for the most outstanding achievement concerning improvements in the operation of flying-boats. This achievement may be theoretical or practical in connection with the organization, flying or navigation of flying-boat flights or services, but not in connection with the design or construction of flying-boats.

The Derry and Richards Memorial Medal will be available for bestowal annually to a pilot not on active service in Her Majesty's Regular Forces but professionally engaged in flying for testing or development of British aircraft, whose flying over a period of time, including the previous year, has been of outstanding value to the advancement of the science of aviation.

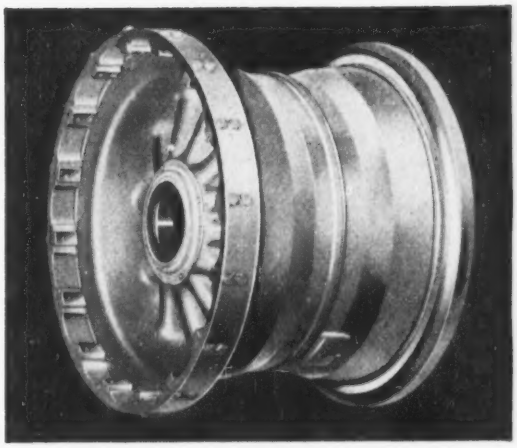


COMET 2 COCKPIT: The flight deck of the Avon-powered Comet 2 differs only in minor respects from that of the Series 1, although the four power levers control an extra 8,000 lb. thrust. This picture was taken in one of the machines now being completed for B.O.A.C. at Hatfield; protective wrappings cover control columns and trim-wheels.

New wheel unit for 'Argonaut' shows 800% longer service life

GOODYEAR WHEELS GIVE 9,600 MORE LANDINGS

A STRIKING operating economy has recently been made for the British Overseas Airways Corporation. Their "Argonaut" airliners, serving Near and Far Eastern routes, are equipped with single disc wheels and brakes designed and manufactured by the Aviation Division of the Goodyear Tyre & Rubber Co. (G.B.) Ltd. They give 9,600 more landings than the assemblies previously in use.



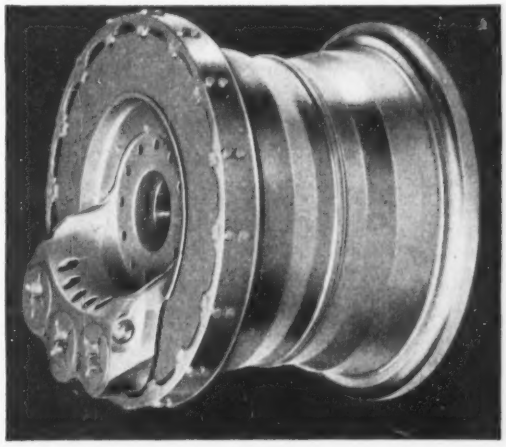
The Goodyear wheel as fitted to B.O.A.C. Argonauts. The wheel is cast from magnesium alloy and is of divided construction incorporating inboard and outboard halves. This greatly facilitates mounting and dismounting tyres.

LESS SERVICING NEEDED

In addition they require the minimum of servicing. The assembly is designed so that the brake clearance remains constant throughout the whole life of the linings. Adjustments are therefore unnecessary.

This is one instance of the way in which wheels and single disc brakes designed by Goodyear combat increased operating costs, whilst giving more satisfactory service.

The Goodyear Aviation Division will help you solve your landing gear problem, too. Technical representatives are always available to give advice, or to join in consultation with your own design staff. They will help you see the job right through, from the drawing board to installation and servicing.



Wheel and brake form a unit which gives many more landings, every one safe because of automatic adjustment of lining clearances. Servicing requirements are less frequent and are carried out more quickly.

You can trust

GOODYEAR

AIRCRAFT TYRES
WHEELS
BRAKES

AVIATION DIVISION, GOODYEAR TYRE & RUBBER CO. (GT. BRITAIN) LTD., WOLVERHAMPTON

THE AIRSPEED "AMBASSADOR"

Another aristocrat of the air using

Bostik *in its construction*

From open cockpits to sealed cabins was not the easy transition many people assume. Building a cabin was one thing; making it proof against wind and rain was quite another thing. The problem (and it was a problem) was solved with BOSTIK Glazing Compound. Today, you will find BOSTIK products of one kind or another in all modern aircraft; and we are particularly proud of the fact that no fewer than five BOSTIK products were used in the construction of the magnificent Airspeed "Ambassador".

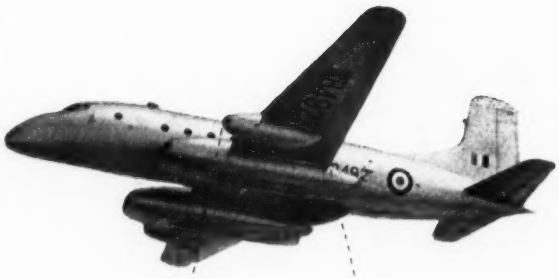
* *BOSTIK Sealing Compounds No. 1751 and 1790 were used for the Integral Tanks and Pressurization. BOSTIK Sealing Compound No. 1222 was used for the Pilot's Screens. PRESTIK Sealing Strip and BOSTIK 'C' Adhesive were used for various sealing and adhesive jobs, and BOSTIK Sealing Compound No. 1753 for interfaying.*

Bostik

ADHESIVES AND SEALING COMPOUNDS

in the daily service of Britain's aircraft industry since 1934. BOSTIK is a registered trademark of

B. B. CHEMICAL CO. LTD., LEICESTER



Prototype sheet metal work for the aircraft industry

Our illustrations show the Avro Ashton and the nacelles specially produced by Helliwells for this research aircraft. The execution of prototype sheet metal work is an aspect of the Helliwell resources upon which aircraft manufacturers can call at the experimental stage of important projects. Our highly skilled and widely experienced prototype department is capable of producing aircraft components of every kind in sheet metal by hand methods and offers a comprehensive and reliable service in this specialised field.

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Telegrams: **HELLIWELL, WALSALL** *Telephone:* **WALSALL 4553 (6 lines)**

I-DIMA is the registration of this handsomely finished DC-6B, the first of four ordered by Alitalia. This Italian airline has now received two of its new Douglas transports; delivery dates for the others are January 2nd and February 3rd. On Monday next the type is due to enter service on the Rome-Buenos Aires route, taking over from the non-pressurized DC-4.

CIVIL AVIATION . . .

MORE PASSENGERS FOR SWISSAIR

AMONG the many airlines reporting encouraging traffic figures, largely as a result of the introduction of tourist fares in Europe, is Swissair. During the first nine months of this year the company carried 297,502 passengers, over 5,000 more than in the whole of 1952. Swissair observe that although tourist-class fares are a third below normal rates, the company's revenue has increased by nearly one-third over the same period. The third quarter of 1953 seems to have been a particularly profitable period; during these three months Swissair carried 160,675 passengers compared with 102,317 during the third quarter of 1952. Freight and mail traffic also increased, though not to the same spectacular extent. The "average utilization degree in the regular flight traffic" (which is presumably Swissair's way of saying "overall load-factor") was 76.2 per cent for the third quarter of 1953, compared with 72.6 per cent for the corresponding period last year.

TOURIST SERVICES DEFINED

DETAILS were given in last week's issue of the increases and decreases to the standard fares charged for travel on the routes of I.A.T.A. airlines. In addition to fixing a total of 30,000 rates and fares, the I.A.T.A. traffic conference, held in Honolulu last month, also defined the respective standards of service which can be offered on first-class and tourist-class flights. Minimum seating densities were prescribed for all the major types of aircraft used by I.A.T.A. carriers; 21 types are covered, ranging in size from the DC-3 (21 seats) to the Breguet Deux-Ponts (107 seats). The idea of the two-class airliner is now well established and fifteen of the 70 member airlines will be operating services with such aircraft during 1954. To prevent possible abuse of this system, other airlines insisted upon a resolution specifying "complete and effective separation" of the two classes. The conference also decided on world-wide standard baggage allowances—44 lb for tourist and 66 lb for first-class passengers on all journeys, with excess baggage carried at 1 per cent of the adult single fare. No alcohol will be sold or served on tourist aircraft in the Western Hemisphere or across the Pacific, and elsewhere it will be sold only at fixed minimum prices: e.g., the minimum charge for "two ounces of hard liquor" will be 2s. Other resolutions fixed the number of cabin attendants who may be carried on tourist services, and the value of "give-aways," which may not exceed 1s 9d per passenger.

PREMIER'S PILOT

THE second notable journey by B.O.A.C. Stratocruiser *Canopus* within a month ended at 1133 hr on December 11th, when Sir Winston Churchill and Mr. Anthony Eden returned from Bermuda; also aboard for the return journey was M. Laniel, the French Prime Minister. In command on the Premier's flight was Capt. James Percy, who has made over 270 crossings of the North Atlantic. He began his career as a ground engineer with Imperial Airways 24 years ago; after training privately as a pilot he began flying for Imperial Airways in 1932, becoming a captain two years later.

PREMIER'S CREW: The B.O.A.C. Stratocruiser which carried Sir Winston Churchill to and from Bermuda was manned by (right to left): Capt. J. Percy, Capt. J. Nicholl, 1st/Off. S. A. Brook, Nav/Off. W. Richardson, R/Off. C. L. Cheesman, Eng/Off. D. Buck, Eng/Off. J. L. Perry and Stewards J. Bury, J. E. H. Smith and D. Robb; the other member was Stewardess E. Hunter.

MORE SCANDIAS FOR S.A.S.

FOR use mainly on the airline's domestic services, two more Saab Scandias have been ordered by Scandinavian Airlines System. The additional aircraft, which are part of a number being built under licence by Fokkers in Holland, will increase the S.A.S. fleet of Scandias from six to eight aircraft. Four more of these 32/40-seat twins have been ordered by the Brazilian airline VASP, which is already operating six on the Rio/Sao Paulo/Curitiba and Rio/Porto Alegre routes. Since their introduction into service early in 1951, Scandias are stated to have completed without accident some 40,000 flying hours and 10m passenger-miles.

B.E.A. PROFIT DOWN

DESPITE the impressive results achieved with both Viscount and Elizabethan during the past summer, B.E.A.'s accounts for the first half of the current financial year show that clear profit (£250,000) earned during this peak traffic period is just over £50,000 less than for the corresponding months of 1952. Operating profit for the April-September period was £569,000, which is £103,000 better than the figure in the first half of the preceding financial year. B.E.A. state that heavy interest charges (totalling £309,000) on the new aircraft are responsible for the reduced surplus. Since the Corporation has yet to face the "winter trough" it seems unlikely that there will be any reduction in deficit for the 1953-54 financial year. Traffic figures for the first six months show a 27 per cent increase in revenue ton-miles flown; lower fares were charged, however, and the corresponding gain in revenue was 15 per cent.

SABENA'S HELICOPTERS

IN a preliminary report on experience gained during the first three months of their pioneering international helicopter network, Sabena announce that the three Sikorsky S-55s carried 3,094 passengers between September 1st and November 30th. These seven-seat rotorplanes are at present providing twice-daily services on the Brussels-Antwerp-Rotterdam route and daily services from the Belgian capital to Liege, Maastricht, Cologne, Bonn and Lille. The intermediate stops generally last three minutes.

Most of the passengers filled in questionnaires asking their views on the value and quality of the service. They appear to have been divided fairly evenly into two classes—transit passengers on their way to pick up air connections at Melsbroek of Deurne, and local travellers making their way from

NIGHT SCENE at Southend Airport: a consignment of shoes from Basle is off-loaded from a Dakota of B.K.S. Air Transport, one of five operated by this growing independent company.

CIVIL AVIATION . . .

one town to another. About 75 per cent of the transit passengers are business men, most of whom used the helicopter service to save time. Despite the S-55's relatively high operating costs, fares are kept down to approximately the same level as for normal tourist-class air travel, and only 8 per cent of the passengers complained on this score. The only general complaint was on the subject of cabin noise-level, and the overall reaction to this new type of travel was very favourable.

BREVITIES

AT the invitation of the Council of Europe, I.C.A.O. is convening a conference to discuss ways of co-ordinating European air transport. A provisional agenda has been prepared and the conference will be held next spring at Strasbourg.

* * *

The committee formed by the Indonesian Government to examine plans for the complete nationalization of Garuda Indonesian Airways is expected to reach a decision soon. At present half the share capital of just under £3m is held by K.L.M.

* * *

Representatives of the Corporations and of Aer Lingus, U.A.T. and Panair do Brasil were principal guests at a party held at London Airport on December 10th by Smiths Aircraft Instruments, Ltd.

* * *

C.A.A. certification for the Douglas DC-7 was awarded on November 30th, 22 months after the initial design drawings were begun. During the C.A.A. flight-testing programme, which began on July 22nd, three examples of the type made a total of 204 flights.

* * *

It is reported that S.A.S. hope to inaugurate their northern route between Scandinavia and the United States next summer, but that the American military authorities have refused permission for the airfield at Thule, Greenland, to be used as a staging post. The airline's DC-6Bs are now expected to fly *via* Bluie West 8, initially to Seattle and later to Los Angeles.

* * *

At a recent meeting of the Joint Air Transport Committee of the Association of British Chambers of Commerce, the Federation of British Industries and the London Chamber of Commerce, Mr. J. S. Wills was elected chairman for the ensuing year in succession to Mr. Leslie Gamage, M.C. Sir John Dodd was elected deputy chairman.

FROM THE CLUBS

SUITABLE Christmas gifts for club enthusiasts are among the large range of items of pilots' equipment available to flying club members and Royal Aero Club members and associate members from the air touring department at the R.Ae.C. Aviation Centre (Londonderry House, Park Lane, London, W.1). The articles range in price from Douglas protractors at 5s 6d to the Swissair Navigator at £4 9s, and include Dalton computors, Perspex rulers, Maclean protractors, the Reed Navigraph and the Goudime course-and-speed plotter. Publications include the *Air Touring Guide to Europe, Student and Private Pilots' Handbook* by H. H. Edwards, and pilots' log-books.

THE Goudime course-and-speed plotter, mentioned in the above paragraph, has been designed for use with 1:500,000 scale maps, and is made by the aeronautical division of Electronic Equipments, Ltd., of Richmond, Surrey. While possessing the useful features of the Douglas protractor, it enables, in addition, ground speed, drift, and times and distances along route to be read off directly from the map without any calculation. Reports from private pilots who have used the device have been favourable, and the plotter itself appears both simple and useful. Measuring 8½in × 5½in, the Goudime plotter costs 30s.

SOCIAL activities of the Yorkshire Aeroplane Club during November included the annual ball, a bonfire party and a film show. There is to be a New Year's party on December 31st, and Father Christmas is likely to arrive by air at the children's Christmas party to be held on January 2nd. Bad weather prevented a large total of flying hours for the month, which amounted to 35. A new activity at Sherburn next year may be parachuting. Peter Rayner, a member of the Yorkshire club who has for some years been instructing individual pupils, intends to start a parachuting school there in the spring of next year.

A FILM entitled *How an Aeroplane Flies* was shown at Fair Oaks recently, but since bad weather prevented a large audience attending, it is likely that it will be shown again early in the New Year. It is hoped that a film on elementary meteorology also will be obtained in the near future. For those members who are interested in night flying, or who wish to obtain a night rating on their licence, the club is prepared to arrange night flying each Wednesday evening between 5 p.m. and 7.30 p.m., weather permitting. The cost will be £5 per hour. Weather at Fair Oaks was more co-operative than elsewhere, and a total of 105 flying hours was recorded for November.

TOTAL flying hours and membership of the Derby Aero Club had both increased, it was reported at the annual general meeting on November 29th. During the 12-month period reviewed, the club's aircraft had flown 1,288 hours and there were now 208 members, compared with the 899 hours and 186 members of the previous year. Eighteen A.T.C. cadets had learned to fly under the flying scholarship scheme, and 62 members held P.P.L.s. Two Magisters, one Auster and one Gemini made up the club's fleet. Burnaston House is being taken over by the club, following the closure of the R.A.F. Flying Schools at the airport.

REPRESENTATIVES of travel organizations and others from the motoring and flying worlds met at the Waldorf Hotel, London, recently to hear from Mr. Freddy ("Any Questions?") Grisewood about a new tourists' map of Great Britain. Most aviation people are also drivers, and light aircraft and glider pilots probably take an even greater interest in the countryside than those travelling on four wheels. Thus the information provided by this new Foldex map, which includes the location of airfields and historic landmarks in addition to all the usual information, carries a double interest for the airman. Skilful use of eight different colours permits the inclusion of a great deal of detail information in a four-miles-to-the-inch map without confusion of presentation.

Some points mentioned by Mr. Grisewood regarding the preparation of this new map are of general interest. For example, it took four years to complete the production of the twelve sections (which can be provided separately, in various combinations, or as a whole). Printing, after deducting lost time, amounted to six months. The finished product contains 18,500 sq in of map surface, about 4,700ft of hand-drawn lines, 42,250 hand-drawn names, and 40,000 numbers and symbols. With Christmas so near, it may be mentioned that the complete map—in a single folder in leathercloth, leather or pigskin—costs between 57s 6d and 105s. Single sheets are 3s 6d.

On the occasion of the introduction of this map by Foldex, Ltd., of 45 Mitchell Street, London, E.C.1, reference was made to the excellent varnished wartime flying-maps (1:500,000) and it was learned that, partly as a result of American interest, the possibility of again preparing pure flying-maps is being examined.

R.Ae.C. PILOTS' CERTIFICATES AWARDED—NOVEMBER 1953

No.	Name	Class	Date
28,545	E. N. Cooper	2	3.11.53
28,546	R. J. G. Fairrie	4	3.11.53
28,547	C. J. L'Estrange Malone	1	5.11.53
28,548	J. B. Shaw	3	5.11.53
28,549	J. R. Davie	2	10.11.53
28,550	R. J. Riches	2	10.11.53
28,551	Miss J. I. Grimaldi	3	16.11.53
28,552	J. G. East	2	18.11.53
28,553	L. N. Monnickendam	4	19.11.53
28,554	L. Richards	4	21.11.53
28,555	A. G. Head	1	30.11.53

COVENTRY'S FIRST HUNTER: This Hawker Hunter F.2 (Armstrong Siddeley Sapphire) is the first to be built in Coventry, by Sir W. G. Armstrong Whitworth Aircraft, Ltd. It was test-flown recently from Baginton by A. W.'s chief test pilot, E. G. Franklin, and by Frank Murphy, of Hawkers. Armstrong Whitworth are still building Meteor night fighters for the R.A.F. and Sea Hawks for the Royal Navy.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News

Jet "Aries"

NAMED *Aries IV*, an English Electric Canberra B. 2 of the R.A.F. Flying College was scheduled to leave London Airport yesterday (December 17th) for Capetown on a long-range training flight for navigator students. The out-and-back journey was expected to be completed within two days and, as it was possible that existing London-Capetown records in each direction might be bettered, arrangements were made with the Royal Aero Club for the flights to be officially timed.

The main problem confronting the staff and students of the College, who comprised the crew, was that of flying over primitive country with few navigational and ground aids, and of obtaining the best possible performance in terms of speed and range. On the outward flight the captain and pilot was W/C. G. G. Petty, D.S.O., D.F.C., a syndicate leader at the College, and the navigators were S/L. T. P. McGarry, D.F.C., and S/L. J. McD. Craig, D.F.C., who are students. Captain and pilot on the return flight is W/C. A. H. Humphrey, O.B.E., D.F.C., A.F.C., the senior instructor at the College, with S/L. D. Bower, M.B., senior navigation instructor and S/L. R. F. B. Powell, a student, as navigators.

The outward route was London Airport, Idris (Libya), Brazzaville (Fr. Equatorial Africa), Wingfield (Capetown), a distance of more than 6,000 statute miles. The return route is to be the same, or, if the take-off conditions at Wingfield make it necessary for the Canberra to take off with a light fuel load, *via* Livingstone (Northern Rhodesia), Kano and Idris.

Lessons and techniques learned in the London-New Zealand Air Race are being put into practice during the flights, but the ground organization is on a small scale and largely self-supporting. A Hastings transport aircraft was flown out in advance by W/C. Humphrey to set down supplies and ground crew at staging posts on the route. This aircraft will be flown back by W/C. Petty.

Like its predecessors, *Aries IV* has been fitted by the makers with long-range tanks and additional navigation aids. It is one of six Canberras supplied to the College in place of piston-engined aircraft. The Hastings is WD499, which has flown four times over the North Pole.

New Commanders for A.A.F.C.E.

REPLACING Maj-Gen. Dean C. Strother, Maj-Gen. Robert M. Lee, U.S.A.F., assumed command of the 4th Allied Tactical Air Force on November 20th. He is at the same time Commander of the 12th U.S. Air Force, which combines with the 1st French Air Division and 1st Canadian Air Division to make up 4th A.T.A.F.

Command of the 2nd Allied Tactical Air Force was assumed on December 7th by Air Marshal Sir Harry Broadhurst, K.B.E., C.B., D.S.O., D.F.C., A.F.C., who relieved Air Chief Marshal Sir Robert Foster, K.C.B., C.B.E., D.F.C. Sir Harry Broadhurst also took over national command of the 2nd Tactical Air Force—the R.A.F. contribution to the British/Belgian/Dutch 2nd A.T.A.F. Sir Robert Foster is retiring from the R.A.F.

Before assuming their NATO commands, General Lee and Air Marshal Broadhurst were, respectively, Director of Plans in the office of the Deputy Chief of Staff for Operations at the Pentagon, and Assistant Chief of Air Staff (Operations) at the Air Ministry in London.

R.A.F. Appointments

THE Air Ministry announces the following recent appointments:

Group Captains: R. J. Rackham to H.Q. No. 1 Group, for technical staff duties; G. H. White, O.B.E., to H.Q. Technical Training Command, for administrative staff duties.

Wing Commanders: F. W. M. Jensen, to Allied Air Forces Northern Europe, for staff duties; B. O. Dias to No. 8 Recruit School, to instruct; R. R. Jack, to R.A.F. Cosford, for administrative duties; H. J. R. Hailstone, O.B.E., to No. 29 Maintenance Unit, to command; J. B. Holgate, D.F.C., A.F.C., to R.A.F. Gibraltar, to command; L. W. Percival, M.B.E., to R.A.F. Worksop, for technical duties; W. C. T. Brown, to H.Q. No. 12 Group, for technical staff duties; G. D. Burrill, to H.Q. 2nd T.A.F., for administrative staff duties; S. L. Swain, to H.Q., M.E.A.F., for administrative staff duties; R. P. Breen to H.Q. British Forces Aden, for administrative staff duties; W. G. Devas, D.F.C., A.F.C., to R.A.F. Hornchurch, for administrative duties; H. H. Eccles, to R.A.F. Staff College, Bracknell, for directing staff duties; H. A. England, to R.A.F. Staff College, Bracknell, for directing staff duties; S. R. R. Smith, to R.A.F. St. Mawgan, for administrative duties; R. J. Oxley, D.S.O., D.F.C., to H.Q. Fighter Command, for administrative staff duties; F. H. P. Austin, to Air Ministry for duty in the Department of the C.A.S.; C. C. F. Cooper, to R.A.F. Acklington, for flying duties; A. J. Mott, to H.Q. Fighter Command, for air staff duties; S. C. W. Rudd, M.B.E., to Air Ministry for duty in the Department of the Chief of the Air Staff.

New D.P.S.

IT is announced that G/C. John Forde Hobler, C.B.E., has been appointed Director of Personal Services at the Air Ministry, with the acting rank of air commodore.

Air Commodore Hobler has been Senior Personnel Staff Officer at Flying Training Command since May, 1952. Previously, from April, 1950, he had commanded R.A.F. Station, Habbaniya. Between January, 1948, and March, 1950, he was Deputy Director of Plans at the Air Ministry.

In 1939 A. Cdre. Hobler was engaged on flying duties with No. 142 Squadron of the Advanced Air Striking Force and subsequently served on various duties at R.A.F. Stations Binbrook and Eastchurch, and at Headquarters Nos. 1, 61 and 91 Groups until August, 1942. In December that year he was given command of No. 20 Operational Training Unit. In 1945 he took No. 15 War Course at the R.A.F. Staff College, Haifa, and the following year joined the directing staff of the College. He transferred to the R.A.F. from the R.A.A.F. in 1932 and was granted a permanent commission in 1938.

R.C.A.F. Korean Awards

THE President of the United States has approved the award of the United States Air Medal to four R.C.A.F. fighter pilots who served with the U.S.A.F. in Korea. The medals are for distinguished combat operations and are awarded to: W/C. Robert T. Davidson, D.F.C., F/L. Grant H. Nichols, F/L. Frederick W. Evans, D.F.C., and F/O. Andrew Lambros, D.F.C.

MALAYAN SUNSHINE: The Colonial Secretary for the Colony of Singapore, Mr. W. A. C. Goode, pauses by a Harvard, on the occasion of his recent inspection of the Malayan Auxiliary Air Force, to chat with P/O. Jimmy Chew, who represented Singapore at the Coronation. In the centre of the picture is G/C. A. V. Bax, Senior Air Staff Officer, Air Headquarters, R.A.F. Malaya.

SERVICE AVIATION . . .

Apprentice School Leaves St. Athan

THE R.A.F. Administrative Apprentice Training School, which has been stationed at St. Athan (Glam.) since May, 1947, is to move to Hereford early in the New Year. The last passing-out parade at St. Athan will be that of the 16th Entry on December 18, when Air Vice-Marshal L. J. V. Bates, C.B., C.B.E., Director-General of Equipment, Air Ministry, will be the reviewing officer.

The administrative apprentice training-scheme was inaugurated in 1947 as a revival and extension of the pre-war apprentice clerk scheme. It is designed to train apprentices to fill accounting and secretarial position in the R.A.F. and to provide for the supply organization men who act not only as storemen but also undertake related clerical duties such as equipment accounting and provisioning. Entrants who are between the ages of 15½ and 17½ are attested for a period of 12 years' regular service from the age of 18.

Home Command Tie

LATEST of the R.A.F. Commands to have its own tie is Home Command. The tie is dark blue, with the badges arranged diagonally; it may be worn by all Regular, Auxiliary or Reserve Officers or airmen who are serving, or who have served, in units of Home Command. The tie will be obtainable shortly from Gieves, Ltd., 27 Old Bond Street, London, W.1, at 14s 6d (rayon), 16s 6d (rayon with silk badges), and 23s 6d (all silk).

R.A.F. War History

THE first of the three volumes of the history of the Royal Air Force in the Second World War, by Denis Richards and the late Hilary St. G. Saunders, was published by Her Majesty's Stationery Office, at a price of 13s 6d, last week.

The history, which bears the title *Royal Air Force 1939-45* was officially commissioned, and both authors were given full access to official documents, from those concerned with the higher direction of the war down to the sortie and combat reports of individual pilots. They also drew on the records of the enemy and—to preserve some contact with the human side—on personal accounts.

During the greater part of the war both authors enjoyed exceptional opportunities of studying the progress and direction of the British air effort—Denis Richards as the head of a group of historians and technical experts writing confidential studies for the Air Ministry, Hilary Saunders as an official diarist for Combined Operations Headquarters and the Allied Expeditionary Air Force and the author of such Air Ministry wartime accounts as *The Battle of Britain* and *Bomber Command*.

In the opening volume by Denis Richards the story is taken from the first stirrings of rearmament in 1934 to approximately the close of 1941. It tells of pre-war plans and preparations, the leaflet raids and the "phoney war," improvized intervention in Norway, heroic efforts by the Advanced Air Striking Force and the Air Component in France; of the desperate days of the Battle of Britain and the struggle to master the night raider of the "blitz"; of lack of success in bombing pin-point targets in Germany and the decision to attack large industrial areas; of the growing use of aircraft against the U-boat and the surface raider; and of the whole series of campaigns in 1940-41 for control of the Mediterranean and the Middle East.

Among the many famous incidents which feature in this volume are the attempt to operate Gladiators from a frozen lake in Norway, the attack on the Albert Canal bridges, the evacuation from Dunkirk, the great air battles of August and September 1940, the bombing of Coventry, the airborne assault on Crete, the siege of Habbaniya and the escape of the *Scharnhorst* and *Gneisenau*. The appendices include details of Members of the Air Council, Air Commanders-in-Chief, the organization of home and overseas commands and performance data of British and enemy operational aircraft of the period. The price of the volume is 13s 6d.

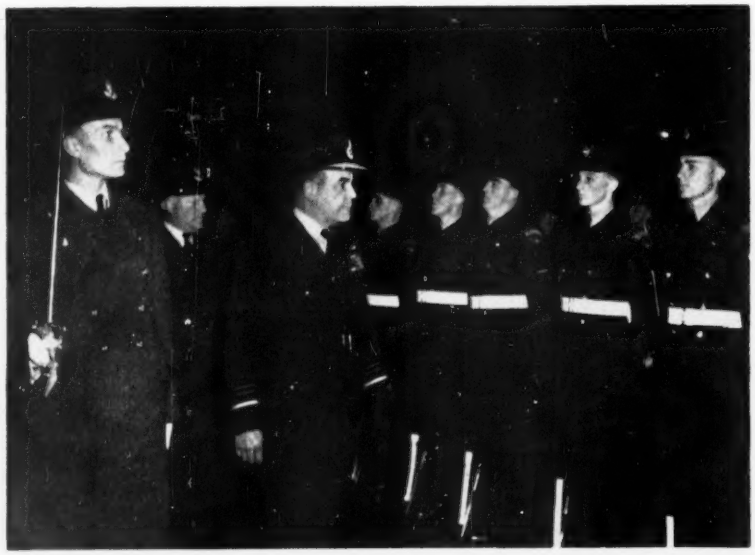
Volume II, opening with the Japanese invasion of Malaya in December 1941 and extending to mid-1943, with operations in Italy up to May 1944, and Volume III—from mid-1943 to the end of the war—will be published in the spring and summer, respectively, of 1954.

R.C.A.F. Appointments

THE following appointments are announced by the Royal Canadian Air Force: A. Cdre. Clare L. Annis, O.B.E. (now attending the Imperial Staff College in the United Kingdom), to be chief staff officer at Air Defence Command, St. Hubert, P.Q.; A. Cdre. F. S. Carpenter, A.F.C., C.D., also now attending the Staff College, to be Chief of Air Operations; A. Cdre. L. E. Wray, O.B.E., A.F.C., to be Deputy Air Member for Personnel.

Button-sticks Obsolete

WITH the approval of the Air Ministry, R.A.F. officers and other ranks may now wear anodized aluminium buckles and buttons on their greatcoats and No. 1 dress. These buttons are said to be untarnishable and, in colour, indistinguishable from the standard brass ones worn with R.A.F. uniforms for so many years.



NEW C-IN-C. of the 2nd Allied Tactical Air Force is Air Marshal Sir Harry Broadhurst. He is seen inspecting an R.A.F. Regiment guard of honour at Buckeburg on the evening of December 1st, when he arrived to take over command from Air Chief Marshal Sir Robert Foster, who is retiring from the R.A.F. A news item appears on the previous page.

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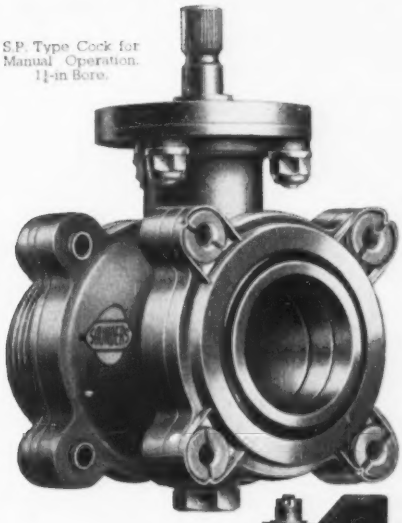

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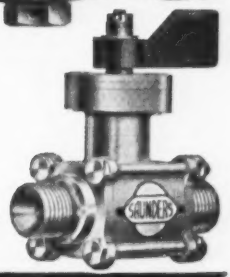

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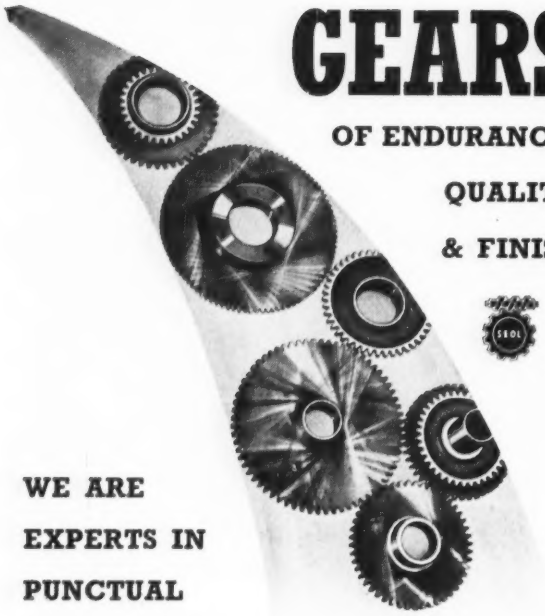

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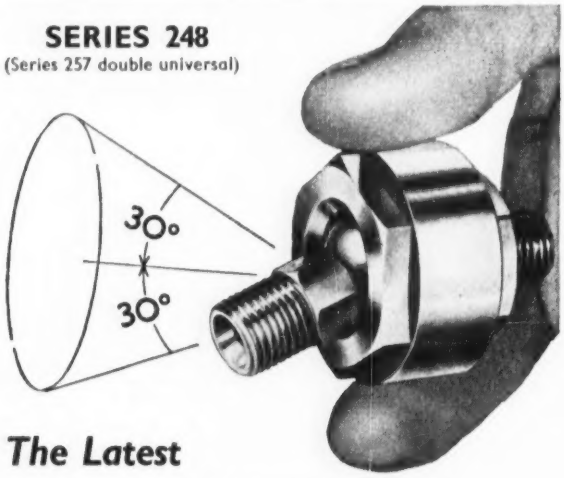

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Postal Orders and cheques sent in payment for advertisements should be made payable to Iliffe & Sons, Ltd., and crossed & Co.

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The Publishers retain the right to refuse or withdraw advertisements at their discretion and do not accept liability for delay in publication or for clerical or printer's errors although every care is taken to avoid mistakes.

Situations Vacant. The engagement of persons answering these advertisements must be made through the local office of the Ministry of Labour and National Service etc. if the applicant is a man aged 18-64 or a woman aged 18-59 inclusive, unless he or she or the employer is excepted from the provisions of The Notification of Vacancies Order 1952.

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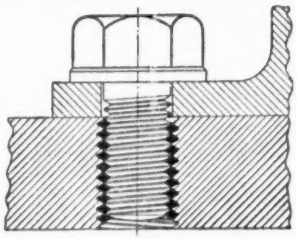

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Application No. 230. From Airwork, Ltd., 15 Chesterfield Street, London, W.1, for an all freight service with Dakota, Hermes, York or Bristol 170 aircraft, for the carriage of freight and mail between London Airport and Bahrein with intermediate traffic stops at Tripoli (Lebanon) or Beirut, Kirkuk, Baghdad, Basra, Kuwait, Dhahran and Dukhan at a frequency of from two to seven services weekly during the period from March 1st, 1954 to February 28th, 1964.

THIS application will be considered by the Council under the terms of reference issued to them by the Minister of Civil Aviation on July 30th, 1952. Any representations or objections with regard to this application must be made in writing, stating the reasons and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 9 Buckingham Gate, London S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, must reach them within the period allowed for the making of representations or objections. [1414

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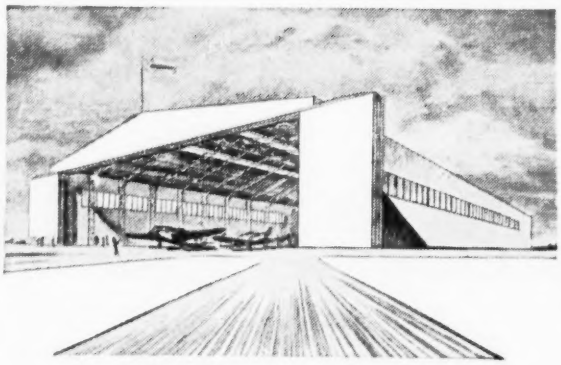

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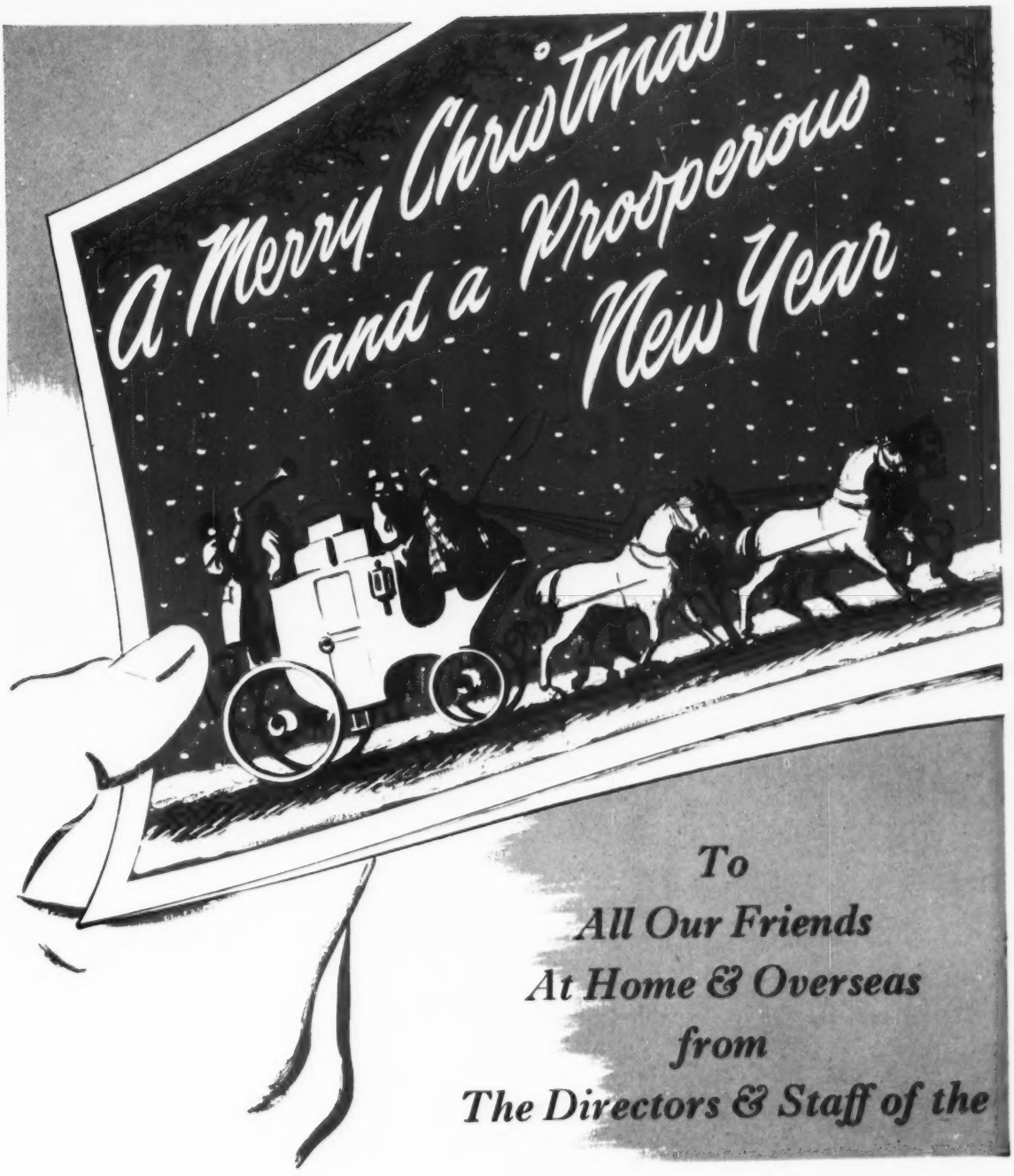

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